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Review of Society Activities
in 1936

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A 5126 Regional Meeting

Symposiums on Lubricants and
Corrosion Testing

Chicago, March 2, 3

Statistical Methods as Aids to
Quality Standardization
and Control

Pittsburgh District Meeting
to Discuss Glass

Extensive Annual Meeting
Program Developing

JANUARY, 1937



BULLETIN

AMERICAN SOCIETY FOR
TESTING MATERIALS

260 S. BROAD STREET

PHILADELPHIA, PENNA.



C. J. Blackmon, Chief Inspector,
Atlantic Steel Co., Atlanta, Ga.

**"READING RESULTS AS SIMPLE
AS READING TIME ON A WATCH!"**

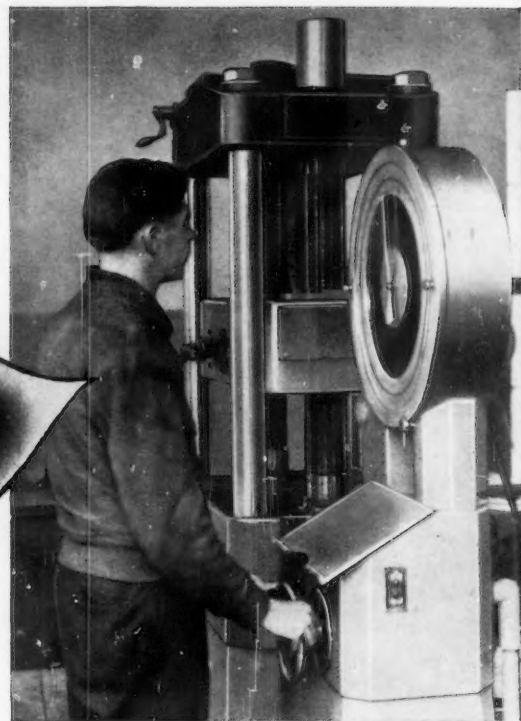
Chief Metallurgist
Atlantic Steel Co.

**"For Ruggedness and Accuracy
it was only natural that we
specified the Riehle Hydraulic"**

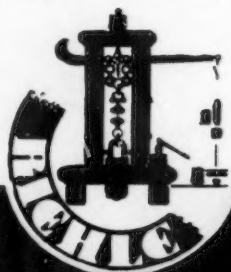
Atlantic Steel Company, Atlanta, Georgia, use their Riehle Precision Hydraulic Testing machine for all physical tests in their mill. Wire, angles, hoops, reinforcing bars, rail, billet steel and flats are tested—loads running to the 200,000 pounds limit of the machine and wire tests as low as 1,000 pounds.

"It is the best machine I have ever seen," says C. J. Blackmon, Chief Inspector. "Fool-proof, with an accuracy well under the guaranteed 1% margin of error. It is so sensitive that it responds to the tremors of passing cars and even the weight of a specimen or tools on the table. We have never experienced a minute's mechanical trouble."

There are no springs, no levers in the Riehle Precision Hydraulic. No recalibrations are necessary. Write for folder describing this machine.



In the Riehle Precision Hydraulic Testing Machine, the ram is powered by a motor-driven oil pump and moves at a constant speed under control from a single hand wheel. The load indicator has a single dial. By adjustments to the Indicator pendulum arm, three scales are provided, one-tenth, one-half and full. All loads are read on the single dial. Two automatic safety power cut-offs, one controlled by the limit movement of the table and the other by the load limit of the machine, protect the unit completely against over-movement or overloading. A transverse table and transverse and bending tools provide for bending as well as tensile or compression tests. This table extends beyond the central table on extension arms at each end and permits tests of unusually long span. The load scale is quickly adjustable to compensate for the weight of the specimen and grips or other loads on the machine not caused by the test itself. The need for any compensation factors is therefore avoided.



RIEHLE DIVISION

American Machine and Metals, Inc.

100 Sixth Avenue New York, N. Y.

"ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS"

AMERICAN SOCIETY FOR TESTING MATERIALS

BULLETIN

260 SOUTH BROAD STREET

PHILADELPHIA, PA.

"Promotion of Knowledge of Materials of Engineering and Standardization of Specifications and Methods of Testing"

Number 84

January 30, 1937

Regional Meeting and Committee Week in Chicago

**Symposiums on Lubricants and on Corrosion Testing are Technical Features;
Committee Meetings in Progress Throughout the Week**

PREVIOUS regional meetings of the Society have been featured by a single symposium on some pertinent subject, each of these technical contributions having been a valuable one. The 1937 Regional Meeting in Chicago will be unusual in that there will be two symposiums, one on lubricants being developed by Committee D-2 on Petroleum Products and Lubricants under the direction of a committee headed by H. C. Mougey of the General Motors Corp., and the other, on corrosion testing, developed by a joint committee of Committees A-5 on Corrosion of Iron and Steel and B-3 on Corrosion of Non-Ferrous Metals and Alloys. Dr. F. N. Speller, National Tube Co., is directing the organization of this symposium.

The preliminary program calls for the session on corrosion testing to be held on Tuesday evening, March 2, with the lubricants symposium on Wednesday morning and afternoon.

During the week beginning Monday, March 1, and extending through Friday, March 5, there will be in progress the Group Meetings of A.S.T.M. Committees.

General arrangements for the meetings will be made by the Chicago District Committee headed by W. A. Straw of the Western Electric Co. This committee is planning a Regional Meeting Dinner to be held on Wednesday evening, at 6:30 p.m. An interesting program of entertainment for the dinner is being developed and detailed announcements will be made to all members in the Chicago District and also to all members of committees participating in Committee Week.

LUBRICANTS SYMPOSIUM

The Symposium on Lubricants will consist of four technical papers by outstanding authorities with prepared dis-

cussion of each of the papers presented by selected authorities. The list of papers and authors follows:

ENGINE DEPOSITS—CAUSES AND EFFECTS—W. A. Gruse, Senior Fellow, Mellon Institute of Industrial Research.

AUTOMOTIVE BEARINGS—EFFECT OF DESIGN AND COMPOSITION ON LUBRICATION—A. J. Underwood, Assistant Head, Power Plant Dept., General Motors Corp., Research Laboratories Section.

ADDITION AGENTS FOR LUBRICATING OILS—G. M. Maverick, Standard Oil Co. of New Jersey.

HOW TO SELECT A MOTOR OIL FROM THE STANDPOINT OF THE CONSUMER—W. S. James, Chief Engineer, Studebaker Corp.

Because of the timeliness of the subject of this symposium, the prominence of those who will present the papers and the very active work which is done by the Society through its Committee D-2 in the field of petroleum products and lubricants, the symposium will attract considerable interest and it is expected to be of particular significance in view of the numerous recent developments in this field.

SYMPOSIUM ON CORROSION TESTING

The joint committee charged by Committees A-5 and B-3 with studying desirable steps to be taken in the direction of standardization of corrosion testing methods feels that the symposium it is developing will be an excellent preliminary step. Doctor Speller, who has taken the lead in developing the program, has enlisted the efforts of men whose names

It is planned to duplicate the papers in the two symposiums in advance of the meeting depending on how soon they are available. Members who are interested in the papers and who wish to have copies in advance should write A.S.T.M. Headquarters indicating the ones they desire.



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are synonymous with outstanding work in this field. The program for the symposium follows:

- PRINCIPLES OF CORROSION MECHANISM AND TESTING—R. B. Mears, Aluminum Company of America, and C. W. Borgmann, National Tube Co.
 ATMOSPHERIC TESTING—H. S. Rawdon, National Bureau of Standards.
 SALT SPRAY TESTING—E. H. Dix, Jr., Aluminum Company of America.
 INTERMITTENT IMMERSION TESTING—D. K. Crampton, Chase Brass and Copper Co., Inc.
 TOTAL IMMERSION TESTING—R. J. McKay, W. A. Wesley, and F. L. La Que, The International Nickel Co.
 SOIL CORROSION TESTING—K. H. Logan, I. A. Dennison and Scott Ewing, National Bureau of Standards.

There will be widespread interest in this symposium on the part of numerous engineers and technologists. Discussion of the papers will increase the value of the symposium.

All members of the Society and others who are interested in the subjects of the symposiums are cordially invited to attend.

COMMITTEE WEEK

Many of the Society's standing committees will take advantage of Committee Week and hold meetings in Chicago. The procedure by which various main committees and their subgroups hold meetings during the five-day period has been successful and is definitely helpful in conserving the time and expense of a large number of members who are active in the work of different committees.

A committee schedule is developed to keep to a minimum the number of possible conflicts.

There follows a list of the committees which thus far have decided to meet in Chicago:

- | | |
|---|--|
| A-1 on Steel | D-8 on Bituminous Waterproofing and Roofing Materials |
| A-2 on Wrought Iron | D-11 on Rubber Products |
| A-5 on Corrosion of Iron and Steel | D-18 on Soils for Engineering Purposes |
| A-10 on Iron-Chromium-Nickel and Related Alloys | E-1 Subcommittees |
| C-9 on Concrete and Concrete Aggregates | Joint Committee on Effect of Temperature on the Properties of Metals |
| C-13 on Concrete Pipe | Joint Committee on Exposure Tests of Plating on the Non-Ferrous Metals |
| D-2 on Petroleum Products and Lubricants | Research Committee on Fatigue of Metals |
| D-3 on Gaseous Fuels | Sectional Committee (Z 11) on Petroleum Products and Lubricants |
| D-4 on Road and Paving Materials | |
| D-5 on Coal and Coke | |

A number of other committees are considering holding their meetings at Chicago and undoubtedly many of these will participate. Complete details will be furnished all members of the participating committees.

Extensive X-ray Symposium Published

ONE of the most extensive technical publications and one which in the opinion of many technologists will be one of the most valuable published by the Society has just been issued, the Symposium on Radiography and X-ray Diffraction Methods. The twelve extensive technical papers and discussion comprising this symposium were presented at four sessions of the 1936 A.S.T.M. annual meeting in Atlantic City. The symposium was organized by Subcommittee VI on X-ray Methods of Committee E-4 on Metallography. Dr. R. F. Mehl, Professor of Metallurgy, Carnegie Institute of Technology, was chairman of the Symposium Committee and also heads Subcommittee VI. In the extensive work necessary to develop the symposium, Doctor Mehl had the close assistance of Dr. H. H. Lester, Watertown Arsenal; Dr. J. T. Norton, Massachusetts Institute of Technology; and Dr. C. S. Barrett, Carnegie Institute of Technology.

The major purpose of the committee in arranging for the symposium was to provide an opportunity so that the practical usefulness of X-rays and gamma rays in the testing of materials could be discussed in such a way that the true utility of the methods could be evaluated, and at the same time new results, both practical and scientific, could be brought to the attention of those interested in the testing of materials.

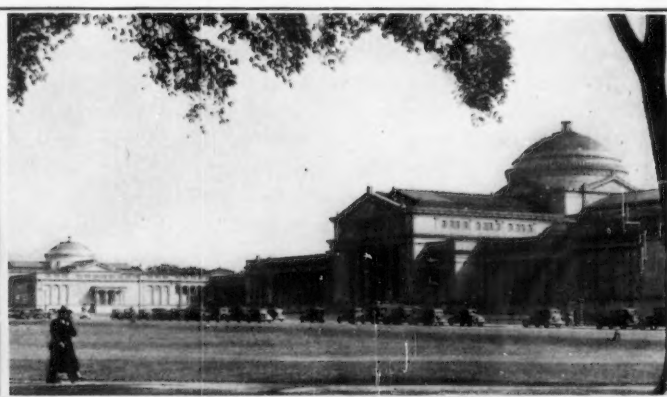
The final symposium was preceded by a preliminary one held at the 1935 annual meeting in Detroit in which a large number of workers gave results of their work with special emphasis on case histories of important applications in the testing field. There was discussion of standard X-ray and gamma-ray methods, both for radiography and diffraction. All of this material was available to the editors who were selected for the task of summarizing the information in the twelve papers which comprised the published symposium.

This volume is one of the most profusely illustrated the A.S.T.M. has published. These illustrations add immeasurably to the value of each paper and assist greatly in making the contributions of real practical value. The book itself is 350 pages in length and copies are available in blue cloth binding at \$4 each, with special prices on orders in quantity. The members' price is \$3. The manner in which the symposium was developed is assurance that the book will be a very valuable one for a number of years to come.

Members who have sent in their orders to Society Headquarters will receive their copies in the near future, since the books have been placed in the mails.



In the Chicago Loop



Museum of Science and Industry



1936 An Outstanding Year for the Society

Review of Standardization, Research and Other Activities Shows Many Important Accomplishments: Committee Activities Described and Future Work Discussed

IN MANY ways 1936 was an outstanding year for the Society, not only in the carrying to a successful conclusion of a great many standardization and research activities, but also in the expansion of current programs of work and especially in the organization of new projects involving important fields. All of the numerous meetings held during the year were very successful ones with record-breaking attendance. Many of the committees completed extremely active work programs and instituted a great deal of new work.

In the accompanying article following the general résumé of outstanding Society accomplishments as a whole, there are given reviews of some of the more important developments as reported by various committees. These reviews are segregated, information on committees in the ferrous fields appearing first, followed by discussion of the non-ferrous group and in turn by cementitious, ceramic, concrete and masonry materials committees, and finally by committees working in the field of paints, petroleum products, gaseous fuels, road materials, coal and coke, electrical insulating materials, rubber products, textiles and industrial waters.

ANNUAL MEETING

After a most interesting annual meeting in the Middle West, Detroit, in 1935, Atlantic City was selected for the 1936 gathering. This meeting was featured by a most extensive technical program, with a registered attendance of 1131, this figure exceeding that of any other meeting save the one in Chicago, in 1931, which cannot be considered a normal meeting.

During the meeting which included some 18 technical sessions, 51 committees presented annual reports and there were 62 technical papers given. Committee meetings during the week totaled 180.

The outstanding feature of the meeting was the Symposium on Radiography and X-ray Diffraction Methods, comprising twelve technical papers and extensive discussion necessitating four complete sessions. This symposium, which has just been published (it is reviewed in this *BULLETIN*), is considered one of the most valuable and extensive of the technical contributions yet published by the Society. It was the first formal symposium organized on the subject in an English-speaking country and because of this is considered an outstanding achievement. Other noteworthy features of the meeting were the Symposium on the Limitations of Laboratory and Service Tests in Evaluating Rubber Products sponsored by Committee D-11, and the session on bituminous materials with a number of valuable papers. One of the most extensive papers yet presented at a meeting was given by Messrs. Swanger and Wohlgemuth of the National Bureau of Standards on "Failure of Heat-Treated Steel Wire in Cables of the Mt. Hope, R. I., Suspension Bridge," describing studies under way at the Bureau of Standards for a number of years on the failure of the Mount Hope suspension bridge cable wire. This paper was awaited with much interest by a large number of engineers and technol-

ogists concerned with this subject. The first session at any A.S.T.M. meeting devoted entirely to the subject of water brought forth several interesting papers, one of which on "The Use of Solubility Data to Control the Deposition of Sodium Sulfate or Its Complex Salts in Boiler Waters" is of outstanding interest to this field.

An interesting and instructive Edgar Marburg Lecture was given by Dr. Arthur L. Day, Director, Geophysical Laboratory, Carnegie Institution of Washington, on the subject, "Developing American Glass," in which he outlined the history of glass development and illustrated particularly contributions which American industry has made in the development of glass-making processing machinery. (An announcement of a local meeting in Pittsburgh on the subject of glass appears in another portion of this *BULLETIN*.)

REGIONAL AND LOCAL MEETINGS

The 1936 Regional Meeting held in Pittsburgh under the sponsorship of the Pittsburgh District Committee was featured by a Symposium on High-Strength Constructional Metals. The five papers comprising this included a great deal of valuable technical data on the more recently developed alloys in this growing field.

During Committee Week there was a total of 140 meetings of main committees, sections and subcommittees. The registration for the week, totaling 626, exceeded that for any other similar period.

During the year all of the Society's District Committees held meetings. Some of these were joint meetings with other societies and all of them contributed definitely to the advancement of the Society's work. These meetings have been described in the *A.S.T.M. BULLETIN*. Two of the meetings were featured by symposiums, namely, the one in Philadelphia at which the Symposium on Industrial Fuels was the feature comprising four technical papers by outstanding authorities and the Cleveland meeting with its Symposium on Pearlitic Malleable Iron developed by a special committee. Both of these symposiums have been published. The meeting in New York was devoted to the subject of "Synthetic Resins"; the Southern California meeting discussed "Progress in Earthquake Design and Control." The Detroit meeting with an attendance of 400 was addressed by Dr. John Johnson, U. S. Steel Corp., on "The Use and Abuse of Tests." Two meetings were held in Chicago at which were discussed "Unusual Methods of Inspection" and "Value to the Industries of the Exact Determination of Physical and Chemical Properties." The last meeting held was sponsored by the Northern California District Committee in San Francisco with discussion on the subject of "Welding."

The renewed activity on the part of the district committees in sponsoring these meetings has been one of the high points of the Society's year and each of the committees in the various industrial centers has well laid plans for the continuation of its activities and the advancement of the Society in its area.



NEW STANDING COMMITTEES; WORK IN NEW FIELDS

The organization of three important new committees during the year is of much importance. A new Committee on Soaps and Detergents, designated as Committee D-12, held its organization meeting and has made progress in its fields which involve soaps and detergents, including the materials entering into their manufacture. Outstanding technologists in this field are participating in the work.

A new Sectional Committee on Petroleum Products functioning under the procedure of the American Standards Assn. with A.S.T.M. as sponsor was organized at the annual meeting. This committee was established because of the increasing interest in specification work and in order to plan and coordinate standardization work in this field. Many groups interested in petroleum and its products are represented on the committee which includes national organization and governmental departments.

Another article in this BULLETIN deals with the organization meeting of the new Committee on Soils for Engineering Purposes. The rapid development of technical knowledge and the desire for the development of standardization activities prompted the formation of this group and it has a most extensive program confronting it.

Mention should be made of the development now under way of other standing committees on the subjects of glass, plastics, thermal insulating materials, and paper, this last having been in course of development for some time. During the year it is anticipated that the organization of some of these committees will be formally accomplished.

PUBLICATIONS

During 1936, the Society issued more pages of regular publications than in any preceding year and a number of special volumes were published including the extensive and valuable Symposium on Radiography and X-ray Diffraction Methods and the Symposium on High-Strength Constructional Metals. It is of particular significance that the various A.S.T.M. publications received a wider distribution during the past year than in any other period. This is true of most of the publications, but especially of the compilations of standards in specific fields such as petroleum products and lubricants, coal and coke, refractories, textile materials, and rubber products.

STANDARDIZATION

A major accomplishment under this subject during the year was the publication of the triennially issued Book of A.S.T.M. Standards. All of the standing committees made intensive efforts to bring revisions of existing standards into final form and also took action to recommend the adoption of a large number of tentative specifications as standard. The result was a large increase in the total number of A.S.T.M. standards, reaching the figure of 513. All of these are given in their latest approved form in the 1936 Book of A.S.T.M. Standards, Part I, Metals; Part II, Non-Metallic Materials.

Numerous committees perfected many proposed standards on which they had been working for some time and the review of committee work which follows will give an idea of the large number of important engineering materials which have been covered for the first time by new tentative specifications. The total number of tentative specifications is

now 283, bringing the total number of all standards and tentative standards to 796.

For the first time, there has been issued a volume of all A.S.T.M. Methods of Chemical Analyses of Metals, which includes the 19 tentative standards under the jurisdiction of Committee E-3 on Chemical Analysis of Metals. A review of this publication appears on another page of this BULLETIN. The new publication includes the extensively revised and combined tentative methods of chemical analysis of steel, cast iron, open-hearth iron and wrought iron which have been modernized to include currently used procedures.

RESEARCH

During the year, a number of new projects to develop needed information and data on the properties of materials and methods of testing were instituted by various committees. Of major significance was the beginning of the extensive atmospheric corrosion tests on wire and wire products which are being carried out under the auspices of Committee A-5. With the exception of the test side at State College, Pa., all of the specimens of plain unfabricated wire, barb wire, wire strand, farm fence and chain-link fence have been erected at the eleven test sites. There are almost 11,000 test specimens involved in this vast research project.

During the year grants were made from the Society research fund to three standing committees on projects involving the effect of testing speed on strength and elastic properties of concrete, the measurement of power factor and dielectric constant of liquid insulation and investigation of various methods of capping clay tile upon the apparent strength values obtained in the compression test.

A detailed review of the some 126 research projects being carried out under Society auspices was given in the October BULLETIN. Reprints of this are available and will be sent without charge on request to any members or others interested in having this detailed review.

Steel

Committee A-1 on Steel had one of its most productive years in 1936. In addition to the preparation of twelve new specifications for materials which were accepted as A.S.T.M. tentative standards, there were 14 of the tentative standards, previously prepared by the committee, adopted as A.S.T.M. standard, including three specifications covering alloy-steel castings, pipe and forgings for service at temperatures from 750 to 1100 F.

Many materials not covered by previous specifications are included in the group of new tentative standards. These include fabricated bar or rod mats and welded wire fabric for concrete reinforcement, one-wear and two-wear wrought steel wheels, and seamless alloy-steel (4 to 6 per cent chromium) still tubes and heat-exchanger and condenser tubes. Three of the new specifications have been under development in the Steel Committee for a number of years and their issuance as tentative specifications marks the completion of an important phase of this work. The materials covered are high-strength structural rivet steel; alloy-steel bolting materials for high-pressure and temperatures up to 1100 F. and nuts used in bolting for high-pressure service at temperatures up to 1100 F. Other materials covered by



the specifications include seamless steel boiler tubes for high-pressure service, structural nickel steel and high-carbon and quenched carbon-steel joint bars.

The recommendations to adopt as standard tentative specifications covering alloy-steel castings for structural purposes and carbon-steel and alloy-steel castings for railroads were approved. Several changes in the specifications for carbon-steel castings for miscellaneous industrial uses were accepted and the specifications were issued under a new serial designation (A 27), replacing the previous standard specifications which were considered obsolete.

Mention should be made also of important changes adopted as standard in the specifications for hot-rolled bar steels and cold-finished bar steels and shafting. The committee adopted a simplified system of grade designation and included grades of steel known to be in relatively wide commercial demand. Several changes in analysis limits were approved.

During 1937 the committee will consider actively a number of proposed specifications which are being drafted, and plans to review in detail various comments which have been received on several of the existing specifications in its charge.

The Research Committee on Yield Point of Structural Steel, which has had a comprehensive series of investigations under way, expects to finish the experiments on Test Series No. 351, dealing with the influence of age on the yield point. It is planned to submit the resulting data to the committee with a review of the findings of the committee during the past nine years so that a final report can be prepared.

Wrought Iron

A new tentative specification was prepared during the year by Committee A-2 on Wrought Iron covering high quality single and double refined bars. The requirements in general are in agreement with those of the Association of American Railroads and provide a standard for a grade of single refined iron not previously covered by A.S.T.M. Existing specifications for uncoated and zinc-coated (galvanized) wrought-iron sheets were adopted as standard.

The standard specifications covering refined wrought-iron bars, which permit the use of purchased wrought-iron scrap in its manufacture, were revised to indicate clearly by the inclusions of a maximum manganese content of 0.15 per cent that scrap purchased on the open market is almost certain to contain steel. While material purchased to this specification may serve many purposes adequately, it is recognized by the committee that such material is not a high quality of wrought iron.

Proposed revisions in the specifications for hollow and solid staybolt wrought iron and for single and double refined bars (A 86, A 84 and A 189 respectively) are being balloted upon by the committee, having been approved at a recent meeting. The principal revision is the reinsertion of the word "puddling" which was omitted from all wrought-iron specifications in 1930, simultaneously with the adoption of a definition for wrought iron. It is intended that the process clauses of all specifications for wrought-iron products will be revised in 1937 to include a definite reference to the process of manufacturing. Exceptions to this general rule are planned with reference to the specifications covering respectively refined iron bars and common iron bars (A 41 and A 85). These specifications are not intended to cover a

high quality material, and therefore the process of manufacture is not considered particularly important.

Cast Iron and Malleable Iron Castings

Included in the important work accomplished by Committee A-3 on Cast Iron were the drafting and publication as tentative of new specifications for light-weight and thin sectioned gray-iron castings and definitions of terms relating to cast iron. The new specifications (A 190) cover castings in which appearance, machinability and dimension tolerances are primary considerations. The definitions (A 196) resulted after detailed consideration of previous definitions of Howe, Moldenke and others, and voluminous correspondence with many metallurgists. Several terms are defined, including cast iron, pig iron, gray iron, white iron and malleable cast iron. The obsolescence of such terms as semi-steel and high-test cast iron are noted.

The specifications for gray-iron castings were adopted as standard with minor editorial changes.

Revisions in certain of the specifications are being studied. Considerable research work on drop impact tests has been done and the results are expected to be sent to the members so that those who wish can carry out tests along the same lines. When sufficient data are available, consideration may be given to the development of standardized requirements.

Committee A-7 on Malleable Iron Castings perfected proposed specifications covering malleable iron for castings made by the cupola process, these being approved as a new tentative standard (A 197). The committee reorganized its subcommittee structure during the year and added groups on specimens and methods of testing air furnace and electric malleable iron and pearlitic and alloy malleable iron.

Committee A-7 cooperated in the development of the Symposium on Pearlitic Malleable Cast Iron sponsored by the Cleveland District Committee. The resulting publication is considered of much value to those interested because published data since 1923 have been largely in patent papers.

Corrosion of Iron and Steel

After careful study, and with the belief that the Preece test, which is very generally used in the industry, should be standardized for use on wire, with the limitations carefully stated, Committee A-5 developed the method of test for uniformity of coating by the Preece Test (copper sulfate dip) on zinc-coated (galvanized) iron or steel wire (A 191).

Committee A-5 is developing revisions of the specifications for several zinc-coated (galvanized) products, including farm-field and railroad right-of-way wire fencing (A 116) and barbed wire (A 121). There will be added heavier zinc coating classes of commercially available materials. Recent developments in the art of zinc coating have made available heavily zinc-coated materials which are commercially important and which the committee has felt should be covered by specification revisions. Likewise the specifications for telephone and telegraph line wire (A 111) and wire strand (cable) (A 122) are being revised to include higher strength base metal and heavier weight of coating classes. In the case of steel wire strand, studies are being made on the inclusion of strand construction of less than seven wires, the seven-wire type now being the only strand covered by specification A 122.



Consideration is being given to the preparation of a specification covering chain-link fence fabric galvanized before weaving as a result of the availability of heavily zinc-coated wire which can be fabricated into such material.

The committee is continuing its work on the development of methods of testing electrodeposited coatings. In particular, microscopic methods for determining thicknesses of coatings are being studied. Further work is also being done on the development of stripping methods for zinc coatings on irregular-shaped articles. Laboratory testing of a series of test coupons and castings is being carried on.

The committee's several extensive corrosion research projects are being continued. The twentieth anniversary of the exposure of black iron and steel sheets at Annapolis was celebrated in October; this event was described in the October BULLETIN. Additional failures of some of the No. 22 gage sheets are reported in the tabulation in the committee's annual report.

The total immersion tests on sheets, riveted test plates, and tubing continue at Portsmouth, N. H., and Key West, Fla. The field tests of metallic coatings on sheets and hardware have been inspected and a discussion of data published appears in the 1936 A-5 report.

An outstanding accomplishment during the year was the virtual completion of the test racks and sites in the committee's program on outdoor testing of wire and wire products. In this country-wide series of tests, 11,000 specimens (about 10 miles of material) of plain unfabricated wire, barbed wire, wire strand, farm fence and chain-link fence have been assembled at all but one of the eleven test sites. The enormously complicated job of collecting, sorting and preparing samples for exposure, of assembling test rack materials and finally erecting the racks and stringing the wire, etc., has been carried out by H. E. Smith, Assistant Director of Tests, with the cooperation of representatives of producers and the agricultural experiment stations of the participating universities. Full details of the program and a table of materials in these tests appeared in the December BULLETIN.

Iron-Chromium-Nickel Alloys; Ferro-Alloys

After detailed discussion at several meetings, Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys completed a new specification approved as A.S.T.M. tentative (A 198), covering alloy-steel castings of the 20 per cent chromium, 9 per cent nickel type, for corrosion-resisting service. This brings to a total of nine the committee's specifications for castings of various compositions and types and three others cover flat-rolled products.

One of the current activities of this committee involves the development and preparation of a summary of data on alloys within the scope of the committee. It is estimated that about two years' time will be required to complete the work.

The committee is also studying precipitation phenomenon in stainless alloys with a view to determining the nature of the carbides. Two heats of the 18 per cent chromium, 8 per cent nickel alloy, unstabilized, have been obtained and samples are in preparation of 1/4 in. to 1/2 in. rounds. These are to be placed in three conditions: namely, quenched, medium and badly precipitated as to carbide and the etch test standardized by having the Bureau of Standards, Navy

Dept., and two producers etch the various groups of specimens. The electrolytic oxalic acid etch and one other is to be considered. When the etch test shows sufficient uniformity, a study of the grain boundary condition and composition of the carbides will be made.

A program on corrosion testing has been developed involving the preparation of recommended methods for corrosion testing such as the nitric acid test, salt-spray test and stain test but not necessarily limited to these specific tests. A statement will be prepared for publication under the sponsorship of the committee dealing with correlation or lack of correlation of corrosion tests for indicating utility of the alloys.

At its June meeting, Committee A-9 on Ferro-Alloys discussed standardized requirements for a number of ferro-alloys including ferro-boron, ferro-selenium, ferro-columbium, ferro-titanium and a number of others. It was decided to undertake the development of standards for ferro-boron, ferro-columbium and ferro-titanium during the next year. The committee has reviewed the specifications now in effect and has brought them up to date and in conformity with current practice.

Magnetic Properties

Committee A-6 on Magnetic Properties Developed a number of changes in the methods of test for magnetic properties of iron and steel (A 34) which were adopted as standard. The major change was the adoption of an induction for core loss tests of 15 kilogausses instead of 14 kilogausses. It is believed that the higher induction gives a better indication of the quality of the material when it is to be used in power transformers and for rotating machines and also agrees better with European practice.

The committee has reorganized its subcommittees, appointing groups on definitions, specifications, direct current test methods, alternating current test methods and magnetic analysis. The principal interests during the coming year include a comparison of results obtained with several methods for direct current testing at high magnetizing forces, and alternating current tests for permeability and core loss at low inductions and core loss tests at high inductions.

Metallography; Fatigue

During the past year, one of the outstanding accomplishments of Committee E-4 on Metallography was the organization and completion of the Symposium on Radiography and X-ray Diffraction Methods, under the direct supervision of Subcommittee VI on X-ray Methods. Further details of the published symposium, which comprises twelve extensive technical papers providing authoritative information on the subject, are given on another page of this BULLETIN.

Another achievement was the adoption as standard (with subsequent approval by the American Standards Assn.) of the revised standard rules governing the preparation of micrographs of metals and alloys, including recommended practice for photography (E 2). The tentative recommended practice for metallographic testing of non-ferrous metals and alloys (E 3) was adopted as standard replacing with modernized requirements, two former standards.

(Continued on page 21)



Glass to be Topic of Pittsburgh Meeting in February

AT A dinner meeting being arranged by the Pittsburgh District Committee and to which all members of the Society are invited, a program on the subject of glass will be presented. The meeting is to be held at 6:30 p.m., Thursday, February 25, at the Hotel Roosevelt in Pittsburgh.

Arrangements for the meeting are being made by Dean Harvey, Materials Engineer, Material and Process Engineering Dept., Westinghouse Electric and Manufacturing Co., and F. M. Howell, Engineer of Tests, Aluminum Research Laboratories, Aluminum Company of America, respectively chairman and secretary of the Pittsburgh District Committee. J. S. Gregorius, Pittsburgh Plate Glass Co., and Chairman, Glass Division, American Ceramic Society, cooperated in the development of the technical program.

It is felt that papers on the subject of glass would be particularly pertinent at this meeting because of the pending organization of a new A.S.T.M. Committee on Glass (see accompanying article on new committee) and because Pittsburgh is one of the largest glass centers in the world. The program is as follows:

Recent Developments in the Glass Industry—E. W. Tillotson, Assistant Director, The Mellon Institute, Pittsburgh, Pa.

Laminated Glass—J. Hervey Sherts, Pittsburgh Plate Glass Co., Creighton, Pa.

Glass Fibres—Games Slayter, The Owens-Illinois Glass Co., Newark, Ohio.

Committee D-9 on Electrical Insulating Materials is holding a series of meetings at the Hotel Roosevelt on February 25 and 26, and the committee will attend the dinner meeting.

In connection with this meeting it is interesting to note that the oldest specimens of glass known came from the banks of the Nile and colored beads and amulets dating back to the fourth millenium B.C. have been found in

Egyptian tombs. Hollow vessels shaped by hand from a viscous glass paste appeared about 1500 B.C.

At the Roman conquest of Egypt, in 23 B.C., glass making was so advanced that Caesar Augustus ordered the conquered people to pay a large part of their tribute in the form of glass. Egyptian craftsmen then came to Rome, and this was followed shortly by the invention of the blow pipe. Rapid progress was made in the art but when barbaric tribes from the north swept over Italy destroying the western part of the Roman Empire the art was almost completely lost in this part of Europe. However, it had developed in the eastern part of the empire and Byzantium (Constantinople) became the world's glass center.

Eventually Venice became the center and for centuries it held a position as the world's leading glass center. To protect their monopoly, the Venetians forbade glass workers to teach strangers their trade and gruesome penalties were meted out to offenders.

In the United States glass making started at Jamestown, Va., in 1609. The first plant west of the Alleghenies was built in New Geneva, Pa., in 1785 and ten years later was established in Pittsburgh.

New Committee on Glass

AT THE recent meeting of the Society's Executive Committee, a new standing committee on the subject of glass and glass products was authorized. At the request of the American Ceramic Society consideration was given to the establishment of the new committee and a conference on the subject was held in Pittsburgh early in January.

A suggested statement of scope for the new committee was proposed at the Pittsburgh conference as follows:

To clarify nomenclature of and develop methods for analysis and testing glass, both as such and as specific products.

It is planned that the committee will develop standards pertaining to glass and glass products and at the same time act as a channel of American participation in the international standardization activities pertaining to glass, this latter activity clearing through the American Standards Assn.

At the present time, there is a subcommittee of Committee D-9 on Electrical Insulating Materials studying electrical and physical properties of glass used as an insulating material and Committee D-15 on Thermometers and Laboratory Glassware is active. The work of the new committee on glass will be coordinated suitably with these two other Society groups.

A steering committee under the chairmanship of Dr. G. W. Morey is being appointed to discuss various problems involved in the organization of the committee including personnel, activities and subcommittee organization. There follows a list of those who have been invited to serve on the Steering Committee:

G. W. Morey, *Chairman*, Geophysical Laboratory, Carnegie Institution of Washington.

H. H. Blau, Macbeth-Evans Division, Corning Glass Works.

F. C. Flint, Hazel-Atlas Glass Co.

J. S. Gregorius, Pittsburgh Plate Glass Co.

W. F. Little, Electrical Testing Laboratories.

J. T. Littleton, *Chairman*, Glass Section, A.S.T.M. Committee D-9

H. C. Mougey, General Motors Corp.

Louis Navias, General Electric Co.

D. E. Sharp, Bailey & Sharp.

W. C. Taylor, Corning Glass Works.

E. W. Tillotson, Mellon Institute of Industrial Research.



Sixteenth
Century
Glass
Blowers

Courtesy
"The Laboratory"
Fisher Scientific Co.

A—Blow-pipe. B—Little window. C—Marble. D—Forces. E—Moulds by means of which the shapes are produced.



BULLETIN

January, 1937 . . . Page 7

Statistical Methods as Aids to Quality Standardization and Control

H. F. Dodge¹

A RECENT publication of the British Standards Institution provides a model of the type of presentation that is so widely sought by the busy engineer—a sufficiency of theory to permit an understanding of the formal groundwork, and a wealth of practical illustrations to show just how theory is put to work on an every-day basis. With the increasing industrial use of statistical methods in problems relating to quality of manufactured product, this publication, "The Application of Statistical Methods to Industrial Standardization and Quality Control,"² will be warmly received, especially by those who have been so fortunate as to have become acquainted with earlier works of the author, Dr. Egon S. Pearson, of University College, London.

Specification, standardization and quality control activities are most effective in industry where the aim is to reproduce the same thing over and over again. Statistical methods are especially designed to deal with repeated series of like events, occurring under generally like conditions. It is practically inevitable then that these methods should become basic tools in modern industry. While there is a considerable basis of mathematical theory underlying the construction of statistical methods, yet in many cases as the author points out, "the methods and the reasons for their application can be made readily intelligible to the non-mathematical reader, so that it is seen that the term 'statistics' is only 'common sense' under another name."

This publication has, therefore, as its main object "to set out as clearly as possible why statistical technique is needed and what kind of assurance it can give." Attention is focused not so much on *new* ways of keeping quality under control as on the advantages "of making use of modern statistical tools in order to achieve this purpose in as simple and efficient a manner as possible."

QUALITY AND ITS MEASUREMENT

In dealing with the subject of quality and its measurement, a studied consideration is given to a primary characteristic of quality—its variability. Physical and chemical properties of a material vary from spot to spot. The performance quality of a finished product varies from article to article. Taking all the units of output, the quality of the whole with respect to any characteristic, such as the tensile strength of malleable iron castings, the breaking strength of successive lengths of cloth, the ash content of successive consignments of coal as disclosed by samples, is fundamentally a frequency distribution—not representable by a single numerical value. This concept of the quality of a product, as a distribution of numerical values around some central or average value, is important. How the measured values vary from unit to unit, how the distributions of such values vary from one batch of product to another, from week to week, from plant to plant, and from supplier to supplier, are features which may be evaluated quantitatively, using a statistical point of view.

The author develops these concepts clearly and concisely for a variety of products—the length of life of incandescent

lamps, the essential service characteristic of an organic chemical, the breaking strength of a roofing material. And he goes on to show the value of periodic collection and analysis of test results in order to provide quantitative data on variability, so urgently needed by specification committees in specifying basic quality limits or setting sampling requirements to be used for purposes of acceptance and rejection.

While many of the techniques he outlines may be familiar to those who have followed the pioneering of such applications in this country, the author has, under one cover, shown the essential interrelationships of various techniques important to industry, has displayed an unusual understanding of the engineer's practical mode of thinking, and has contributed a great deal to what might be termed "the industrialist's grammar of statistics."

CONTROL OF QUALITY; DETERMINING CONFORMANCE

A considerable portion of the report treats the producer's problem of control of quality and the consumer-producer problem of determining conformance of quality to specification, when sampling alone is feasible. Here the author advocates wider consideration and use of the "quality control chart,"³ a statistical device employed for many years in this country, particularly in the telephone industry where it was developed. The control chart offers a practical *operational* technique as a guide for human action, distinctly different in its make-up from the more common statistical techniques of "estimation." Used by the producer for analyzing quality variations for a repetitive series, it provides an indication of when or where to look for assignable causes of variation. A failure to meet its criterion is taken as synonymous with the flash of a red signal which says "look for trouble, and be assured that there exists a findable cause of variation."

If the producer repeatedly investigates, finds and eliminates the causes whose presence are thus indicated and adopts precautionary measures to prevent their recurrence, he may expect to arrive at a stage where remaining variations may be considered as of chance origin and of minimum magnitude consistent with the capabilities of the process he is using. From this point on, as long as his records indicate control at a level well within specified limits, they provide reliable evidence of continued conformance with specification. Furthermore, and of practical importance to management, the number of units that need be tested on a routine basis under such conditions is considerably reduced. In effect, everybody wins! The producer's costs of testing and of rejections are reduced and the consumer gets a better product.

¹ Bell Telephone Laboratories, Inc., New York City; Chairman of Tech. Comm. IX on Interpretation and Presentation of Data, of Committee E-1 on Methods of Testing.

² *The Application of Statistical Methods to Industrial Standardization and Quality Control*, by E. S. Pearson. British Standards Institution No. 600-1935, London. Cloth, 5½ x 8½ in., 161 pages, 25 tables, 17 figures. Copies may be ordered through the American Standards Association library, at \$1.75.

³ The control chart technique is discussed in the A.S.T.M. Manual on Presentation of Data.



This theme is carried forward very effectively by the author, particularly in his discussion of sampling to secure conformity with specifications, a subject to which attention has been given by A.S.T.M. in papers sponsored by its Technical Committee on Interpretation and Presentation of Data. Dr. Pearson brings out clearly the relative merits of two basic methods that may be used to afford assurance to the user that each consignment or batch of material is in accordance with the stipulated standard:

- (1) By a system of tests of samples taken from each batch of finished material
- (2) By a declaration of values and requiring that records be kept which will provide statistical evidence of the level of control of the processes of manufacture. (This is referred to as a "guarantee" or "Mark" system, administrable by a certifying authority.)

A statistical treatment for these two methods is given in some detail. The first method, which is commonly used, involves two practical difficulties familiar to all specification engineers—first, the problem of how to select a sample representative of the consignment, particularly when quality may vary erratically from one portion of a shipment to another, and second, the testing of a sufficient number of units to give the desired degree of information and assurance regarding the quality of the consignment, especially when the test is costly or destructive. The author then offers the important suggestion that the second method, securing conformance by the "guarantee" system, be more widely considered for use by industry, using control chart records to provide evidence as to the satisfactoriness of quality, and lists among its advantages the following:

- "(a) It avoids the difficulty that often arises of determining how to draw a representative sample from a consignment.
- "(b) It saves the cost of sampling on the large scale often necessary to give adequate assurance.
- "(c) Even where it is desirable to carry out occasional tests on samples from consignments to gain assurance that the control in production remains effective, the amount of sampling necessary will be far less than that required to provide definite protection in the face of erratic control.
- "(d) The form of routine statistical analysis necessary to provide the basis of a system of marking would be the same that the producer will employ in attempting to increase the efficiency of his production process."

Technically, the point of view in Dr. Pearson's exposition of control chart theory is somewhat at variance with that developed by Shewhart and used in this country. The leaning is toward the use of arguments involving the principles of "estimation" rather than of "operational techniques"—the use of concepts rather than of operations, such as in the substitution of the term "statistical uniformity" for the term "statistical control." One might ask whether any advantage has been gained in the slight numerical modifications that have been introduced with respect to the constants used in calculating "control limits." Dr. Pearson's constants appear to be based on exact formal probability values rather than on economic factors derived from experience, and the particular choice of constants proposed seems justified on probability grounds rather than on accumulated evidence of a satisfactory performance in practice. These comments may help to explain the reason for the numerical differences between the control chart constants appearing in the British publication on the one hand and Shewhart's text, "Economic Control of Quality of Manufactured Product," and the A.S.T.M. Manual on Presentation of Data, Supplement B, on the other.

Throughout "The Application of Statistical Methods to Industrial Standardizations and Quality Control" there appears to be a nice balance between the statistical and the

practical aspects of the subject. The engineer or production man will see that no panacea is offered—the methods are clearly shown to be aids rather than substitutes for judgment.

SUMMARY

Some idea of the scope of treatment can perhaps be visualized from the following brief summary of the subject matter of the principal sections of the book:

- Illustrations of general problems by examples.
- Introduction to the simpler statistical tools—definitions; the presentation of data; use of mean and standard deviation in scaling a frequency distribution.
- Sampling and statistical theory—statistical uniformity and random sampling; levels of control; sampling methods in practice.
- Statistical theory and specification—the statistical concept of a population; the basis of securing conformance to specification; considerations of importance to the user and to the producer.
- The statistical relationship between sample and batch—variation in samples; reliability of means obtained from representative samples and from duplicate samples.
- Further examples of the use of statistical methods in securing conformity to specification by consignment sampling—systems of grading and classifying; efficiency of a classification applied to random samples from consignments.
- Control charts—basis, description and interpretation.
- Performance tests and indices of quality—the statistical concept of correlation.

Special mention should be made of the many excellent diagrams presented, which help the reader to understand many of the essential points that would be hard to visualize by scanning arrays of cold numbers.

Doctor Pearson is to be congratulated on his success in setting forth in simple and clear language, the practical advantages of invoking the aid of statistical methods in treating quality and sampling problems. By contributing to a wider understanding and use of some of the simpler statistical tools, his work may be expected to assist in securing a closer coordination of activities in this field among engineering societies here and abroad.

Philadelphia Meeting on Wear Testing of Metals

AT A meeting to be held in Philadelphia, late in March or early April, sponsored by the Philadelphia District Committee there is to be held a Symposium on Wear Testing of Metals. The technical program for the meeting has been developed by Dr. G. H. Clamer, President and General Manager, The Ajax Metal Co., and will comprise interesting papers on some of the following subjects: general discussion, including the classification of various types of wear; wear of metals from the railroad viewpoint; from the automotive viewpoint; wear in power equipment; and wear in the textile industry. One or two other subjects will be covered in the symposium.

Further announcements concerning this meeting will be made and each member in the Philadelphia District will receive a detailed notice giving information on the date, time and place and other such details. Invitations will be extended to local members of other national societies and each A.S.T.M. member is cordially invited to attend the meeting. H. M. Hancock, Superintendent, Inspection Dept., The Atlantic Refining Co., and Harold Farmer, Chief Chemist, The Philadelphia Electric Co., chairman and secretary, respectively, of the District Committee, are in charge of arrangements.



A. S. T. M. BULLETIN

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Number 84

January 30, 1937

Appreciating

WHILE the article which comprises a major portion of this BULLETIN is called a "review" and it is designed as an inventory or stock taking of accomplishments of A.S.T.M. for the previous year, it also includes condensed accounts of a large number of the important standardization and research projects under way, or in the stage of active preparation. The information given affords a "preview" as well as a "review."

The inventory clearly indicates that the A.S.T.M. committees have made tremendous strides forward in their work; in fact, all phases of the Society's far-flung programs have proceeded apace. The inventory also points unmistakably to big "stocks" on hand, and available either immediately or in the near future—"stocks" created by the great amount of new work in development.

One of the most important assets of A.S.T.M. is its efficiently functioning committee organization. Many standing committees are extending their work—in fact, most of them, as will be seen from the respective sections of the review article, have numerous new activities developing. Some of these are of major significance—such items as work on metallic materials for radio tubes and incandescent lamps, specifications for gasoline, laminated phenolic materials for electrical insulation and numerous others.

In addition, new standing committees authorized and in course of organization will cover plastics, glass and glass products, paper, and thermal insulating materials, while the new Committee on Soils for Engineering Purposes was organized only in November.

All of this means a continued and increased output of useful engineering data and standardized specifications and tests; it means the Society will be of further service to industry; and it means that membership, enabling close contacts with important developments in many fields, is of still more value.

Research and Standardization

STANDARDIZATION may discourage research, but research is bound to aid standardization. Past-President Clements warned us against the peril of retarding progress by standardizing our minds and ideas. Research and more research "promotes knowledge of the properties of the materials of engineering," the first great objective of the A.S.T.M. This knowledge must be obtained before adequate methods of testing and sound specifications can be promulgated. Sometimes, knowledge is readily available; more frequently research is required to obtain additional data bearing directly on points at issue. Many disagreements in standing committees attended by more heat than light could have been avoided by a well-planned research program designed to obtain facts for the committee to use in place of opinions.

The recent celebration of the twentieth anniversary of atmospheric corrosion tests on black iron and steel sheets at Annapolis, Md., recalls to our minds the old controversy on the effect of small percentages of copper on corrosion resistance. This research was undertaken to answer this question. It has done so and has provided much additional data. More than this, these tests led to numerous other practical exposure tests and to the country-wide wire and wire products tests recently started by Committee A-5. The Symposium on Corrosion Testing at the March Regional Meeting will bring together a splendid record of achievement in the use of research in the standardization of testing methods.

We recommend that standing committees give more consideration to the determination of facts by the experimental method. Producers, consumers, and general interests should get together in planning mutually satisfactory research programs. Lack of committee funds need not prevent such work. Much can be accomplished by the regular staffs of company, institutional, and governmental laboratories with which the committee members are connected. The principal need is the will to do such research. Let each committee become research-minded. The members will be surprised how fast their troubles will disappear.

A. C. Fieldner

President

American Chain and Cable Co. New Sustaining Member

EFFECTIVE as of January 1, 1937, the American Chain and Cable Co. has become a Sustaining Member. This company, formerly the American Chain Co., Inc., has been a corporate member of the Society since 1916. L. W. Hopkins, Materials Engineer, Bridgeport, Conn., will continue as the Society representative of this membership. With the inclusion of the American Chain and Cable Co., Inc., there are now eleven organizations which are Sustaining Members of the Society. This class of membership, with annual dues of \$100, was established so that companies and other organizations wishing to, might support A.S.T.M. work to a degree more nearly commensurate with the intrinsic value to them of the standardization and research activities.



1936 Book of A.S.T.M. Tentative Standards Completed

THE 1936 edition of the Book of A.S.T.M. Tentative Standards (1390 pages) contains 264 tentative specifications, methods of test and definitions of terms covering widely used engineering materials. A large number of the standards are included in this publication for the first time, having just been approved during 1936 and a number were revised during the year and are given in their latest approved form. The general classification of the items follows:

Ferrous metals (forgings, castings, pipe, etc.).....	47
Non-ferrous metals (aluminum, magnesium, copper and copper alloys, zinc, die castings, etc.).....	33
Cementitious, ceramic, concrete and masonry materials.....	35
Paints, varnishes, lacquers and paint materials; waterproofing and roofing materials.....	27
Petroleum products and lubricants.....	13
Road materials and soils.....	41
Rubber products; textile materials; electrical insulating materials.....	48
Miscellaneous materials and general testing methods.....	20

Included in the materials covered by new tentative specifications published for the first time in 1936 are: Alloy-steel bolting materials and carbon and alloy-steel nuts for service up to 1100 F.; high-strength structural rivet steel; fabricated steel bar or rod mats and welded wire fabric for concrete reinforcement; high-carbon and quenched-carbon steel joint bars; one-wear and two-wear wrought steel wheels; seamless alloy-steel (4-6 per cent chromium) heat-exchanger and condenser tubes, and still tubes for refinery service; single and double refined wrought-iron bars; lightweight and thin-sectioned gray-iron castings; uniformity tests, by the Preece method, of coating on zinc-coated iron or steel wire; hard-drawn copper alloy wires for electrical conductors; sheet and strip phosphor bronze; seamless copper-nickel alloy condenser tubes and ferrule stock; magnesium-base alloy bars, rods and shapes; test for deflectivity of thermoflex (thermostatic metals).

In the non-metals field there are new specification requirements and tests covering the following: Glazed building units; terms relating to refractories; super duty fire-clay brick (panel test for resistance to spalling); test for coal and lignite in sand; portland cement concrete (test for flow by the flow table); coal (designating size from screen analysis); zinc chloride; electrical insulating materials (power factor and dielectric constant test); vulcanized rubber (compression set test); carded cotton gray goods (testing and tolerances); fastness to laundering of dyed or printed cotton fabrics and silk and rayon fabrics.

During 1936 important amplifications and changes were made in a number of existing specifications and all of these are given in the 1936 edition in their latest approved form. In addition to the tentative standards there are included also all of the proposed revisions of formal A.S.T.M. standards, these revisions being published to elicit criticism before final adoption.

In order that members who have not ordered copies may have clearly in mind just what the publication comprises, a complete table of contents is enclosed with this BULLETIN; also a convenient order blank, listing the special prices to members—\$5.50 in cloth binding, \$4.50 in heavy paper.

Substantial Membership Gain in 1936

THE cumulative effect of improved business conditions and the efforts of many members of the Society is seen in the substantial net gain in Society membership during 1936 of 226, bringing the total membership as of January 1 to 3819. The number of new members, 415, was the largest since 1926, and the losses from death, resignation and delinquency, 189, were the smallest in many years. The gratifying gains of the past two years bring us a little more than one-third of the way back from the "low" of 1934 to the "high" of 1930; and from present indications 1937 will more than keep pace—it wouldn't be surprising if we reached the 4100 mark this year. Indeed, we can easily go beyond it with the continued help of our members, for the Society's work is expanding rapidly into important new fields that provide many opportunities for growth. Watch the BULLETIN for interesting announcements.

Incidentally, the following figures for new members are significant:

Month of January, 1935.....	61
Month of January, 1936.....	77
Month of January, 1937.....	106

One month doesn't make a year, of course, but isn't this a fine start for 1937?

1937 Nominating Committee

BASED on the report of the tellers, L. G. Wilson, President and General Manager, Precision Thermometer and Instrument Co., and W. F. Faragher, Director of Research, Houdry Process Corp., both of Philadelphia, on the recommendations of members for appointments on the 1937 Nominating Committee for officers, the Executive Committee has appointed the following members of the Society to serve:

Members	Alternates
R. A. Bull	Sabin Crocker
H. J. Ball	K. B. Cook
T. A. Boyd	C. E. Heussner
P. H. Walker	W. R. Fuller
W. H. Bassett, Jr.	R. L. Templin
R. W. Crum	A. T. Goldbeck

Since these members have just been notified of their appointment, there has not been sufficient time to receive acceptances but in case of declination or the inability of a member to be present at the meeting the respective alternate will serve. The Nominating Committee, which in accordance with the By-laws, also includes Past-Presidents T. R. Lawson, Hermann von Schrenk and H. S. Vassar as *ex-officio* members will meet early in March to select nominees for President, Vice-President and 5 members of the Executive Committee whose terms expire with the June, 1937, meeting.

Humidity and Regain at March Textile Meeting

AT its meeting in Providence, R. I., from March 10 to 12 inclusive, Committee D-13 on Textile Materials will sponsor a symposium which will deal with, first, the importance of atmospheric conditions in the testing of textiles of various kinds; and second, regain. R. H. Brown, Research Engineer, Parks-Cramer Co., is chairman of the program committee developing the symposium.



Numerous Technical Features at Annual Meeting

Interesting Program and Entertainment Features Being Developed

THE committees responsible for various phases of the 1937 annual meeting program are making excellent progress along all lines of activity, and what promises to be an outstanding annual meeting is in prospect. A large number of leading manufacturers and distributors of testing instruments and laboratory supplies, etc., will participate in the Exhibit and numerous special features will add to the interest in this affair which is one of the features of the annual meeting in alternate years. The meeting and exhibit will be at The Waldorf-Astoria, New York City, June 28-July 2.

The New York Committee on Arrangements headed by Dr. M. F. Skinker, Brooklyn Edison Co., which is divided into several subgroups responsible for various activities, as detailed in the December BULLETIN, is developing an interesting program of entertainment, trips, etc., for the Society members, and the Ladies' Entertainment Committee also is making plans to see that the large number of ladies who are expected to be present at the meeting will have a most interesting time.

The technical program, which is in the direct charge of Committee E-6 on Papers and Publications, and in the development of which the New York Committee on Arrangements and various Society committees are assisting, includes a number of symposiums and sessions that will be of specific interest to a great many of the members and others who will attend the meeting.

Included in the topics which will be the subjects of numerous papers are a Symposium on Bituminous Materials, Symposium on Correlation of Laboratory and Service Tests on Paints, and a Symposium on the Significance of Tests of Coal and Coke. Other features which will undoubtedly be included comprise a Symposium on Consistency and several papers on the subject of industrial waters.

Preliminary arrangements and solicitation of offers of papers for the Symposium on Bituminous Materials were carried out by J. S. Miller, Jr., The Barber Asphalt Co., and a number of those who have offered papers have been requested to proceed with the preparation of their contribu-

tions. Some of the subjects to be included cover such topics as modern problems in asphalt technology, indentation and shear tests for service stability of asphalt plank, constituents of asphaltic materials *versus* accelerated weathering, aspects of low-temperature ductility testing, and others.

The Symposium on Significance of Tests of Coal and Coke is being arranged by a special committee of A.S.T.M. Committee D-5 on Coal and Coke under the chairmanship of A. W. Gauger, Director, Mineral Industries Research, Pennsylvania State College. The committee plans to solicit five or six papers together with prepared discussion on this subject which should be of widespread interest.

One of the high spots of the meeting will be the Symposium on Correlation Between Accelerated Laboratory Tests and Service Tests being developed by a special committee of Committee D-1 on Paint, Varnish, Lacquer, and Related Products, with H. A. Nelson, The New Jersey Zinc Co., as chairman. At a recent meeting of the committee, details of the symposium were worked out. The preliminary plans call for the discussion of questions and topics under four possible headings: Varnish for exterior service, paints for exterior service on wood, paints for structural steel and paints for service on aluminum and magnesium alloys. The general plan provides for an informal symposium with each topic introduced by some authority who will speak for a short time, and then followed by discussion of different phases of the topics. The object will be to enable those attending the symposium to establish a background of what is known on the subject and an idea of the practical state of the art of accelerated testing. The speakers probably will give some of their own experiences and what accelerated tests mean to them.

The subject of proving by quick laboratory methods the service qualities of paint products is not only an interesting one, but an extremely important one and is emphasized whenever the subject of specifications comes up for discussion. While the quick evaluation of protective and decorative coatings for service still presents a number of problems, it is believed that the exchange of information which will



Manhattan Skyline from Governors Island

Schedule of A.S.T.M. Meetings

DATE	COMMITTEE	PLACE
February 19....	E-6 on Papers and Publications	Philadelphia
February 25-26 ..	D-9 on Electrical Insulating Materials	Pittsburgh
March 10-12....	D-13 on Textile Materials	Providence
March 22.....	C-8 on Refractories	New York City
•		
February 25....	PITTSBURGH DISTRICT MEETING	Pittsburgh
March 1-5.....	COMMITTEE WEEK	Chicago
March 2-3.....	REGIONAL MEETING	Chicago
June 28-July 2..	ANNUAL MEETING	New York City

take place in the Symposium will be of very definite service to all who are concerned with the subject.

Committee D-19 on Water for Industrial Uses is planning to sponsor the presentation of several papers on important topics in this field. Other groups that are doing active work in the field of boiler feedwaters, etc., may cooperate in sponsoring this program.

In addition to these groups of papers there will be a large number of other individual papers as at previous meetings. Quite a number of offers of excellent papers have been received and at its meeting on February 19, Committee E-6 will give consideration to these.

EXHIBIT OF TESTING APPARATUS

Included in the list of leading companies in the instruments, apparatus and laboratory supply field that are planning to participate in the Society's Fourth Exhibit of Testing Apparatus and Related Equipment, to be held in conjunction with the annual meeting, extending from Monday through Friday, are the following organizations:

Ace Glass, Inc.	National Carbon Co.
Amthor Testing Machine Co.	Tinius Olsen Testing Machine Co.
Baldwin-Southwark Corp.	The Palmer Co.
Bausch & Lomb Optical Co.	Palo-Myers, Inc.
Christian Becker, Inc.	Parr Instrument Co.
Cambridge Instrument Co.	Precision Scientific Co.
Central Scientific Co.	Radium Chemical Co., Inc.
Eimer & Amend, Inc.	Riehle Division, American Machine and Metals, Inc.
General Radio Co.	Shawmut Engineering Co.
Great Western Manufacturing Co.	The Standard Electric Time Co.
The Emil Greiner Co.	C. J. Tagliabue Manufacturing Co.
The Instruments Publishing Co.	Carl Zeiss, Inc.
Leeds & Northrup Co.	
E. Leitz, Inc.	

These companies will have on display and demonstrate the latest developments in the instruments and related fields. The instruments will cover various phases in the production, control and testing of materials and products of all kinds.

In addition to displays by companies in the industry, a number of Society committees will have illustrations of their work and a number of educational and research institutions will be invited to display special equipment and devices which they have developed for unusual testing and research work in the materials fields. These committee and research displays have attracted a great deal of interest in previous exhibits and this phase of the 1937 Exhibit is expected to attract much attention.

NEW YORK

The World's Greatest Market Place

A number of great bridges and tunnels provide Manhattan entrances and outlets for traffic. Besides the bridges owned by transportation companies, the city owns and operates 48 bridges over navigable streams. These and the viaducts represent an outlay of \$128,000,000. They reach a total of over eleven miles. The Port of New York Authority controls several bridges, including the George Washington, at 178th St. The total cost was \$75,000,000. With its approaches it has a length of 7800 feet.

New York is the home of 37 institutions of higher education, including 13 general colleges and universities, eight schools of medicine, two schools of law, in addition to law schools connected with the universities, five technical institutions and four schools of theology. Columbia and New York Universities each has enrollments of over 30,000, the former having had 35,000.

Recently the regular public school system showed an average daily attendance of 981,600, with 121,500 more in evening high and elementary schools. Teachers and directors numbering 46,560 received \$134,500,000 yearly. There are some 45 day high schools and three teacher training schools with instructional staffs of 150.

There are 75 parks and 72 playgrounds in the Borough of Manhattan alone—the total park system is some 8800 acres. Battery Park is 21 acres and Central Park, 862 acres in extent. Bryant Park, originally a potter's field and later known as Reservoir Square, when a reservoir for the Croton Aqueduct stood in the present library site, Forty-second St. and Fifth Ave., is four and three-quarters acres in size.

THE WALDORF-ASTORIA

World's Largest Hotel

Several volumes have been written about Peacock Alley, famous feature of the old Waldorf, now incorporated in the new. It is paneled with French walnut burl inlaid with ebony. Here is noted the Carrara marble statue, "The Reading Girl," by Magni, and "Leda and the Swan." In the north end of the alley is the life-size portrait of "Oscar" by the famous artist Paul Trebilcock.

The Main Lobby, 82 by 62 feet, is paneled in Oregon maple burl, with columns of black and gold marble. In this lobby is what is believed to be the largest hand-tufted rug ever woven in a single piece—it is 70 by 50 feet. The carpet took ten months to make, thirty weavers devoting their time to the work. There were tied by hand 12,600,000 knots.

On the third floor are the Ballroom, Jade Room and Astor Gallery and Basildon Room, which will be used for the A.S.T.M. meeting. In all 27 passenger and service elevators serve this floor and all rooms can be approached in a direct and convenient manner. Entrances for use in connection with third floor rooms are on Forty-ninth Street and the Waldorf Driveway, and it is not necessary to enter the Main Lobby or regular hotel elevators to get to this function floor.

The largest all-wave radio receiving system in the world is in the Waldorf. The Waldorf is the first hotel to make provision in all public and private rooms for short-wave reception.



BULLETIN

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XIII. Long-Time Society Members

Thirteenth in the Series of Notes on Long-Time Members

AS A continuation of the series of articles in the A.S.T.M. BULLETIN comprising notes on the outstanding activities of long-time members of the Society, there are given below outlines of the work of three additional members. In general, the men whose sketches will appear in this series will have been affiliated with the Society for 25 years or more and will have taken active part in various phases of Society work for long periods. No definite sequence is being followed in these articles.

C. N. FORREST, Special Technical Representative, The Barber Co., Inc., and Technical Director, The Trinidad Lake Asphalt Operating Co., Ltd., received his education at Maryland Institute and Columbian University (this latter developed into George Washington University). He was



P. H. Walker

C. N. Forrest

F. O. Clements

Assistant Chemist, Baltimore & Ohio Railroad Co., 1892 to 1896; Chemist and Inspector, Long Island Railroad until 1904 when he became Chief Chemist, New York Testing Laboratories. He continued in this capacity, when these laboratories were absorbed by the Barber Asphalt Paving Co., until 1923. He then became Manager of the Technical Department of this company.

A member of the Society since 1901, Mr. Forrest has taken an active part in many phases of A.S.T.M. work. He was a member of Committee D-1 on Paint, Varnish, Lacquer, and Related Products, 1906-1921, and has served on Committee D-4 on Road and Paving Materials since 1909.

He has been vice-chairman of Committee D-8 on Bituminous Waterproofing and Roofing Materials since 1918, and a member since 1916. He has been on Committee D-2 on Petroleum Products and Lubricants since 1921. Other committees on which he holds membership include E-1 on Methods of Testing and E-8 on Nomenclature and Definitions. He is also a member of the Philadelphia District Committee. He served as a member of the Society's Executive Committee from 1933 to 1935.

He has taken a leading part in standardization and research work on road and paving materials and on waterproofing compounds and has written many technical reports and papers presented at meetings of A.S.T.M. and other organizations. He is affiliated with numerous societies including the American Society of Civil Engineers, American Society of Municipal Engineers, Society of Chemical Industry, American Chemical Society, and is a Fellow of the American Association for the Advancement of Science.

F. O. CLEMENTS, Technical Director, Research Labora-

tories, General Motors Corp., is a graduate of Otterbein College, A.B., 1896; M.A., 1898; and Ohio State University, M.Sc., 1899. In 1929 Otterbein conferred on him the degree of Doctor of Science. His first employment was with the Pennsylvania Railroad as Assistant Chemist, 1899-1903, where he was associated with Dr. Charles B. Dudley. Then he was with the Union Pacific Railroad and from 1905 to 1916, Chief Chemist and Engineer of Tests, National Cash Register Co. Then, Doctor Clements was Director of Research, Dayton Metal Products Co. He has been in his present position since 1920.

Doctor Clements has been active in various phases of Society work and has contributed notably to increased interest in Society activities in the Detroit District where he was chairman of the Detroit District Committee from its organization in 1930 until 1936. During this time the first Regional Meeting held by the Society was sponsored in Detroit and numerous other meetings which aided in furthering the knowledge of the Society's work were developed including the very successful 1935 Annual Meeting and Exhibit.

He was a member of the Society's Executive Committee from 1927 to 1929; Vice-President, 1929 to 1931 and President, 1931-1932. During the trying depression years his leadership and encouragement were a source of inspiration to those associated with him in administering Society affairs. He is a member of numerous societies, including the American Chemical Society, Electrochemical Society, Institute of Metals (British), Society of Automotive Engineers, and American Society for Metals. He is President of the Board of Trustees, Otterbein College, and Director, Detroit Metropolitan Board, Y.M.C.A.

P. H. WALKER, Chief, Chemistry Division, National Bureau of Standards, received his university training at the University of Virginia, 1885-1889. Following this he was Instructor in Chemistry and Mineralogy, University of Iowa, 1896, and in the meantime in 1895 he received the degree of Master of Science. He spent semesters at the University of Heidelberg and University of Berlin, returning to Iowa in 1899. He was Associate Professor of Chemistry and Physics at the University of Arkansas in 1902, and in 1904 became an assayer in the Bureau of Chemistry, U. S. Department of Agriculture. He was Chief of the Contracts Laboratory of the Bureau from 1906 until 1914, when he was transferred to the National Bureau of Standards. He served as Assistant Chief of the Chemistry Division for a number of years and in 1936 was named Chief.

During his work with the Government, he has been especially active in work on protective coatings and bituminous materials.

A member of the Society since 1907, he has served on Committee D-1 on Paint, Varnish, Lacquer, and Related Products for over 25 years and was chairman from 1913 to 1919. He has been on Committee D-17 on Naval Stores since its organization in 1924. He served as a member of the Society's Executive Committee from 1923 to 1925.

A member of the American Chemical Society since 1893, he has been especially active in the Paint and Varnish Section. He is also a Fellow of the American Association for the Advancement of Science.

New Volume on Methods of Chemical Analyses of Metals Issued

THERE has just been issued for the first time a new publication, entitled "A.S.T.M. Methods of Chemical Analyses of Metals," containing the 19 tentative methods issued by the Society. These include four methods for analyzing ferrous metals, 12 for non-ferrous metals and alloys and three methods of quantitative spectrochemical analysis of non-ferrous metals. This volume (254 pages) is the only place where these methods appear.

The general analytical procedures are in the charge of Committee E-3 on Chemical Analysis of Metals, while the methods of spectrochemical analysis were developed by Committee E-2 on Spectrographic Analysis.

For over a year Committee E-3 has had intensive work under way on the amplification and modernization of tentative methods of chemical analysis of steel, cast iron, open-hearth iron and wrought iron. These new combined methods were issued in 1936. At the time that they were approved as tentative, action was taken to revert from the status of standards to tentative all of the methods of chemical analysis of non-ferrous metals and alloys, since Committee E-3 is studying these and expects to recommend changes in some of them in the near future.

The new tentative methods applying to ferrous metals were developed to provide methods for the determination of the following elements in plain and alloy steels and irons:

Carbon	Silicon	Vanadium
Manganese	Copper	Molybdenum
Phosphorus	Nickel	Tungsten
Sulfur	Chromium	Cobalt
Titanium	Zirconium	

Some of the new procedures which were added include the following: Phosphorus in austenitic manganese steels, the use of perchloric acid for determinations of silicon and chromium, the cupferron method for small amounts of vanadium, the benzoinoxime method for molybdenum, and the use of cupferron in determinations of titanium and zirconium.

The new methods will comprise an up-to-date treatise on the analysis of steels and irons as compiled by Committee E-3 which includes in its personnel chemists of broad experience in this field. The ferrous section of the new book also contains methods for the sampling and analysis of ferro-silicon, ferro-manganese, ferro-chromium, ferro-vanadium, ferro-tungsten and ferro-molybdenum.

The section on non-ferrous metals embraces methods for the analysis of bearing metals, brasses and bronzes, aluminum alloys, pig lead, slab zinc, nickel, electrical resistance alloys and silver solders.

Each member of the Society is entitled to receive a copy of this new book in paper binding without charge, on request, and he can obtain a cloth-bound copy on the payment of 50 cents. The members' special prices for extra copies are \$1.50 in paper cover, \$2 in cloth. The list prices are \$2 and \$2.50 respectively.

Both parts of the 1936 Book of Standards, a copy of the 1936 Book of Tentative Standards, and the new volume on chemical analysis afford a complete file of all specifications and tests issued by A.S.T.M.

Meeting of Committee D-2 on Petroleum Products

AT A SERIES of meetings of Committee D-2 on Petroleum Products and Lubricants in New York City on January 6 and 7, during which there were sessions of four technical committees, on gasoline, motor oils, fuel oils and Stoddard solvent, several subcommittees and the main committee, there was consideration of numerous activities before the committee. Mention of some phases of the work discussed at the meetings follows:

The subcommittee on corrosion test for lubricating oils which is working on the problem of developing laboratory test methods which will correlate with road service presented data on various samples tested and gave consideration to various questions in connection with further work.

A large group was present at the meeting of the subcommittee on grease at which it was proposed to rewrite a method for dropping point of grease using modified Ubbelohde equipment. There was consideration of changes in the standard grease worker to permit taking penetrations without removing the product and two recommendations for changes in the grease analysis method looking to improved accuracy were proposed. Future committee work on softer greases and a test for channeling were also discussed.

The viscosity subcommittee reported progress in the matter of kinematic-Saybolt conversions, presented a new chart extended to low viscosities and discussed a licensing agreement with local representatives of Doctor Ubbelohde for the manufacture of a patented viscosimeter for kinematic determinations.

The subcommittee on color still has certain details of the specifications for A.S.T.M. Union Colorimeter color standards which require further consideration before offering for inclusion in the standard method. Active consideration of factors involved in the tank gaging is to be started by the subcommittee on sampling and gaging.

The subcommittee on nomenclature reported progress in a collaborative program with foreign standardization groups in the development of a dictionary of terms for the petroleum industry.

As a result of extended study by the subcommittee on natural gasoline, methods of testing natural and motor gasolines for vapor pressure have been brought to the point where practically 95 per cent of all products may be tested by one procedure.

Technical Committee A on Gasoline has drawn up a set of specifications for gasoline which are to be submitted to Committee D-2 for approval. Technical Committee B on Motor Oils has been occupied with developing a series of papers for the Symposium on Lubricants which will feature the A.S.T.M. Regional Meeting in Chicago (see page 1).

Proposed revision of the Commercial Standard Specifications for Fuel Oils elicited an extended discussion in Committee D-2 of the action of Technical Committee C in recommending changes in the procedure for determining water and sediment. Approval was given to changes insuring continued satisfaction to the consumer.

Technical Committee D on Stoddard Solvent approved changes in the definition of boiling range and residue which should insure an improved product.



Progress Report of Joint Concrete Committee to Be Discussed at A.C.I. Meeting

IN A three-day session of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete in December in Washington, the Joint Committee discussed in detail its Progress Report which has been in preparation for many months. While the committee does not yet plan to release the Progress Report for publication by the sponsoring societies, it is rapidly nearing completion.

Through the cooperation of the American Concrete Institute, which with the American Society of Civil Engineers, Portland Cement Assn., American Railway Engineering Assn., American Institute of Architects and A.S.T.M., sponsors the Joint Committee, there are to be two full sessions of the American Concrete Institute annual meeting in New York City, Hotel Roosevelt, February 23 to 26 inclusive, devoted to a discussion of the Progress Report. The sessions devoted to the Progress Report will be on Thursday evening and Friday afternoon. The committee believes this will be an excellent way to obtain the reaction of the engineering profession for whose use the report is reproduced. Immediately at the close of the A.C.I. meeting, the Joint Committee will hold a session to review the discussion which takes place.

The Progress Report departs in form from the 1924 edition in that it is presented as a recommended practice with supplementary specifications covering those subjects on which the information is sufficiently crystallized to justify general standards. The design provisions are entirely in the form of recommended practices.

The principal departures from the substance of the 1924 report are to be found in the provisions for design. These give special consideration to the increasing use of the principle of continuity and the elastic frame analysis in the design of reinforced concrete structures. Because of the essentially monolithic character of reinforced concrete construction these newer methods are not considered merely as refinements, but as an attempt to produce a more rational and better balanced design.

The column provisions are based on the results of tests sponsored by the American Concrete Institute, and in the main follow the recommendations of the committee reporting these tests. The safe loads on columns are expressed in terms of the gross area of the column, the ultimate strength of the concrete, and the yield point strength of the steel. Spirals are given credit only when present in sufficient amount to offset the loss of carrying capacity which might result from damage to the shell. When present in this amount the assurance against sudden failure is recognized by a higher unit stress.

In flat slab construction the very restrictive formula for slab thickness in the previous report has been abandoned. This opens the way to a broader use of high-strength concrete. The provisions for shear and bond have been made somewhat more conservative.

In the field of proportioning concrete the committee has provided alternate specifications. One of these is intended for use when the contractor is specially qualified to give the service of a concrete technician. It gives the contractor rather wide latitude in the selection of mixtures. The other is for use when the engineer has the facilities for making an eco-

nomic study of available materials in advance of the work and can specify exact mixes and quantities.

In both the specifications and recommended practice emphasis is placed on designing concrete for durability. The strength factor is no longer the primary consideration.

Soap Committee Makes Progress at Meeting

AT ITS meeting on December 3 in New York City, Committee D-12 on Soaps and Detergents made important progress in its work. This new A.S.T.M. committee, which was formally organized at the 1936 annual meeting, has for its scope "soaps and detergents, including the materials entering into their manufacture."

H. P. Trevithick, Chief Chemist, New York Produce Exchange, is chairman of the committee; F. S. Smither, Chemist, National Bureau of Standards, is vice-chairman; and B. S. Van Zile, Chemist, Colgate-Palmolive-Peet Co., secretary. The Advisory Committee in addition to these officers includes J. B. Crowe, J. E. Doherty, Ephraim Freedman, G. E. Hopkins, Frederick Krassner and Dr. Pauline B. Mack.

The committee has organized three subcommittees—on methods of analysis, specifications, and definitions and nomenclature. The first-named subcommittee has four sections—on soaps, sulfonated detergents, dry cleaning soaps and special detergents. Subcommittee II on Specifications has seven sections involving textile soaps and detergents, built soaps, straight soaps, dry cleaning detergents, sulfonated detergents, special detergents and metal cleaners.

At its all-day meeting and luncheon in New York City there were 46 members and visitors present. The organization of these various sections was completed and specifications for various soaps and detergents were discussed. The methods of the American Oil Chemists' Society for soap analysis were reviewed and approved for submission to the whole committee for letter ballot. A program was also outlined for the various sections and committees, to be completed before the Spring meeting. At this meeting, the committee hopes to complete proposed specifications for a number of soaps and detergents, to be included in the annual report to the Society for its consideration and action.

Members Invited to Concrete Meeting

ACORDIAL invitation has been extended to members of A.S.T.M. by the Board of Direction of the American Concrete Institute to attend the Thirty-third Annual Convention of the Institute, to be held at the Hotel Roosevelt, New York City, from Tuesday, February 23, to Friday, February 26, inclusive. The first formal session will begin Tuesday afternoon at 2 p.m. Two full sessions of the convention on Thursday evening and Friday afternoon will be devoted to discussion of the Progress Report of the Joint Committee on Concrete and Reinforced Concrete. The accompanying article outlines certain features of this report. Further information about the A.C.I. convention may be obtained from the secretary of the Institute, New Center Building, Detroit, Mich.



New Committee on Soils Organized

Extensive Program Being Developed; Personnel Announced

AT A well-attended meeting held in Washington, D. C., on November 15, the organization was effected of the new standing Committee on Soils for Engineering Purposes. This committee, designated D-18, has been in course of development for some months—a Steering Committee having been appointed to make recommendations on a number of matters, including scope, activities, etc.

At the meeting, the proposed scope of the committee was approved and several subcommittees were authorized. The committee includes in its personnel many of the outstanding technologists in this field. A list of the members appears below.

The meeting was under the direction of C. A. Hogentogler, Senior Highway Engineer, U. S. Bureau of Public Roads, temporary chairman of the new committee, and H. F. Clemmer, Engineer of Materials, District of Columbia, temporary secretary. W. S. Housel, Associate Professor of Civil Engineering, University of Michigan, served as chairman of the steering committee.

SCOPE AND SUBCOMMITTEE STRUCTURE

The statement of scope which has been decided upon as covering the anticipated activities of the committee is as follows:

It will come within the jurisdiction of Committee D-18 to establish methods of sampling and methods of testing soils for engineering purposes, to consider the use of test results in specifications, to select acceptable nomenclature and definitions, and to promote research activity in the general field of properties and behavior of soils for engineering purposes.

It will be the policy of this committee to avoid, in so far as it is possible, control over methods of design of engineering structures and all those features of general practice in the use of soil as an engineering material which may not compromise methods of sampling and testing. It will, however, be considered within the scope of the committee's work to promote by every desirable means the close cooperation of other organizations and committees whose field of endeavor is closely allied to that of soil testing.

After detailed discussion of various phases of the work which are contemplated, it was decided that active development of subcommittees on the following subjects would be instituted:

1. Nomenclature and Definitions
2. Soil Classification
3. Methods of Sampling Soils
4. Tests for the Physical Characteristics of Soils (dried and powdered soils)
5. Tests for Stabilized Soils (with and without admixtures)
6. Tests for Compressibility and Elasticity of Soils
7. Tests for Shearing Resistance of Soils
8. Tests for Mechanical Stability of Soils
9. Tests for Bearing Capacity of Foundation and Sub-grade Soils (Load Tests)
10. Tests for Bearing Capacity of Piles (Load Tests)
11. Methods of Testing Drainage Properties of Soils (Capillarity and Permeability)

On the subject of specifications it was the sense of the meeting that the committee should give particular consideration at an appropriate time to specifications for soil as an engineering material.

After considering the question of executive direction of the committee's work, it was decided at the meeting to

arrange a temporary advisory committee which includes Messrs. Hogentogler and Clemmer and the following members:

- W. S. Housel, Associate Professor of Civil Engineering, University of Michigan, Ann Arbor, Mich.
- A. T. Goldbeck, Engineering Director, National Crushed Stone Assn., Washington, D. C.
- A. E. Cummings, District Manager, Raymond Concrete Pile Co., Chicago, Ill.
- W. R. Nelson, Reclamation Service, Washington, D. C.

PERSONNEL

It will be noted from the following list of members who have accepted invitations for service on the new committee, that there is representation from many of the fields actively concerned with soils.

PERSONNEL OF A.S.T.M. COMMITTEE D-18 ON SOILS FOR ENGINEERING PURPOSES

- American Society of Civil Engineers, Soil Mechanics and Foundations Division, Arthur Casagrande, G. L. Freeman, Glennon Gilboy, J. D. Justin, and W. P. Kimball.
- E. E. Bauer, University of Illinois
- R. K. Bernhard, Baldwin-Southwark Corp.
- Calcium Chloride Association, Fred Burggraf
- California Division of Highways, T. E. Stanton
- California Institute of Technology, F. J. Converse
- Canadian Industries, Ltd., R. M. Rowat
- H. F. Clemmer, District of Columbia
- Columbia University, Testing Laboratories, D. M. Burmister
- A. E. Cummings, Raymond Concrete Pile Co.
- G. L. Freeman, Moran, Proctor and Freeman
- P. J. Freeman, Tennessee Valley Authority
- George Washington University, Frank Hitchcock
- F. S. Gilmore, Asphalt Institute
- A. T. Goldbeck, National Crushed Stone Association
- C. A. Hogentogler, U. S. Bureau of Public Roads
- C. A. Hogentogler, Jr., George Washington University
- W. S. Housel, University of Michigan
- Indiana State Highway Commission, A. R. Smith
- Kansas State Highway Commission, Harold Allen
- E. J. Kilcawley, Rensselaer Polytechnic Institute
- W. P. Kimball, Thayer School of Civil Engineering
- Koppers Co., Tar and Chemical Division, E. O. Rhodes
- C. D. Looker, International Salt Co.
- H. S. Mattimore, Pennsylvania State Highway Dept.
- C. L. McKesson, American Bitumuls Co.
- R. W. Miller, Columbia Alkali Corp.
- Minnesota Highway Dept., F. C. Lang
- National Park Service, E. F. Preece
- L. A. Palmer, U. S. Bureau of Public Roads
- F. L. Plummer, Case School of Applied Science
- Portland Cement Association, F. T. Sheets and M. D. Catton
- Paul Rapp, U. S. Bureau of Public Roads
- F. V. Reagel, Missouri State Highway Dept.
- W. J. Schlick, Engineering Experiment Station, Iowa State College
- Solvay Process Co., W. B. Hicks
- LeRoy C. Stewart, Dow Chemical Co.
- G. P. Tschetobareff, Princeton University.
- Texas State Highway Dept., Henry C. Porter
- U. S. Bureau of Reclamation, Wesley R. Nelson
- U. S. Forest Service, A. L. Anderson
- U. S. Navy, Corps of Civil Engineers, T. L. Davey
- University of Texas, R. F. Dawson, Bureau of Engineering Research
- Lazarus White, Spencer, White & Prentis, Inc.
- E. A. Willis, U. S. Bureau of Public Roads
- K. B. Woods, Ohio State Highway Testing Laboratory
- Yale University, School of Engineering, D. P. Krynine



Inter-Society Color Council Has Active Year

THE Inter-Society Color Council has been functioning actively under its new Articles of Organization and Procedure during 1936. This Council consists primarily of national societies and associations, known as member-bodies, but membership is also held by corporations, firms and individuals. The A.S.T.M. is represented in the Council by H. M. Hancock, A. W. Kenney, M. Rea Paul and W. M. Scott.

In 1936 four News Letters, carrying some 93 pages, were issued to the members. These contained items of color interest, abstracts of many papers on the subject of color, notations regarding commercial color specifications, and references to color standards that have been adopted.

The annual meeting of the Council was held at The Waldorf-Astoria on February 20, 1936. At the conclusion of the business session, three lectures were given on the chemistry of color, color as light and color in use. There were over 500 in attendance.

Members of the Council located in and near Washington, D. C., have formed a group known as "The Colorists" which hold monthly meetings. With the help of the Council, a second group was formed in Chicago under the name of "Association for Color Research."

A Conference on Color was held at Massachusetts Institute of Technology, July, 1936, and members of the Council were requested to present papers dealing with the following subjects: Color problems in the textile industry; the inter-relationship of the various aspects of color; colorimetry in the dyestuffs industry, with special reference to fastness testing; computations involving the standard observer; specification of whiteness; the solution of grading problems by the use of a disk colorimeter; artificial daylight and its application in colorimetry; the Munsell system of color specification; the accuracy of spectrophotometric measurements; specification of the colors of railway signal glasses; the standard observer in colorimetry; color tolerances in terms of material standards; the specification of the whiteness of paper; the optics of pigmented films; the industrial significance of color measurements; and, tolerance in color specifications.

The Council's Committee on Problems has found it necessary to set up various subcommittees to handle the different matters that are brought to its attention. Those projects holding general interest are as follows:

- Project No. 5—Compilation of "Who's Who in Color."
- Project No. 6—Survey of color terms that have been officially adopted by technical societies and associations, or which, through general use, have become well-recognized in industry.
- Project No. 7—Survey of color specifications that have been adopted by technical societies and associations, or which are in commercial use.
- Project No. 8—Survey of color problems that are of broad interest and have been brought before national societies and associations for consideration.

One of the original projects referred to the Council by the National Formulary Committee of the American Pharmaceutical Association requested a new system for naming the colors used in the United States Pharmacopoeia. Such question of color nomenclature is complicated by the fact that there are 100,000,000 distinguishable colors, of which some 10,000,000 are producible by dyes and pigments, and

for which, in the present U. S. P. system, there are only some 500 color names. Each name, therefore, referred to a range of color rather than to a single color. After consideration, the Council's Committee on Measurement and Specification developed a new system of color naming, for use by the U. S. P., that will provide a definite, accurate measure of color strength and tone. The new color names are simple, easily understood, and usable, and are based on a logical, scientific system which gives them a legal standing, making them available for many types of analytical work. The system is based on the use of such terms as red, green, blue and purple, with the component hues: orange, pink, brown and olive. The modifiers are faint, pale, light, brilliant, weak, vivid, strong, dusky, dark and deep, together with the adverb *very*. The resulting terms, such as "very dark blue," would relate to a definite standard of color, rather than to the color education of an individual observer as has been the case. Indefinite names ending in "ish," such as reddish, yellowish, etc., have been eliminated, except as modifiers of definite names, such as reddish purple, yellowish green, etc.

The fundamental method of applying the new system of color names, consists of measuring the spectral reflectance of the substance under study, computing the tri-stimulus specification of it, and deriving the color name from these data. In actual usage, however, reference standards such as the Munsell Book of Color may be used for visual comparison, which, with practice, takes only from one to five minutes. Standardizing laboratories may apply the more fundamental method in cases of dispute or legal demands.

In order to put this new system into effect, research is being conducted at the National Bureau of Standards, under the direction of Dr. D. B. Judd of the Bureau's staff, who is Vice-Chairman of the Council, and by K. L. Kelly, research associate, under a National Formulary research project of the American Pharmaceutical Association which is sponsoring the work as a means of standardizing the color names used to describe official drugs and pharmaceuticals used in the treatment of disease. Many changes in official standards for drugs have already been recommended as a result of the research to date.

In general, the Council does not initiate its own problems, nor endeavor in all instances to provide their solution, but instead, seeks to bring together the individual or technical group having the problem, with some person qualified to provide its solution.

The delegates representing the A.S.T.M. have been active in the affairs of the Council. M. Rea Paul, National Lead Co., and Secretary, A.S.T.M. Committee D-1 on Paint, Varnish, Lacquer and Related Products, is chairman of the Council; A. W. Kenney, E. I. du Pont de Nemours & Co., Inc., is in charge of Subcommittee IV, engaged in a survey of color terms and of color problems; Walter M. Scott, Consulting Chemist, G. J. Esselen, Inc., is chairman of the Membership Committee and is a member of Subcommittee I on "Who's Who in Color."

The Sixth Annual Business Meeting of the Council will be held at The Waldorf-Astoria, New York City, at 2:00 p. m. on February 24. The evening meeting, in the auditorium, N. Y. Electrical Assn. Grand Central Palace, at 7:30 p. m., will be sponsored by the Illuminating Engineering Society, with talks by Dr. D. B. Judd, National Bureau of Standards, and Jovel Lesco, Stage Setting Designer, Metropolitan Opera.



International Congress for Applied Mechanics

THE American Committee, to whom has been delegated responsibility for organizing the Fifth International Congress for Applied Mechanics by the International Committee at its meeting at Cambridge University, England, in July, 1934, has announced that the Fifth Congress will meet in Cambridge, Mass., September 12-16, 1938, at Harvard University and the Massachusetts Institute of Technology. As in the past, this Congress is to be a meeting of persons working in the field of applied mechanics before whom reports of recent work may be presented for discussion.

The program will cover three main divisions of applied mechanics as follows:

- I. Structures, Elasticity, Plasticity, Fatigue, Strength Theory, Crystal Structure.
- II. Hydro and Aerodynamics, Gasdynamics, Hydraulics, Meteorology, Water Waves, Heat Transfer.
- III. Dynamics of Solids, Vibration and Sound, Friction and Lubrication, Wear and Seizure.

Dormitory and boarding facilities will be made available by Harvard University. Further information may be obtained by writing to the Fifth International Congress for Applied Mechanics, Massachusetts Institute of Technology.



Airview of the Waldorf-Astoria

Last Call for Annual Meeting Papers

AT ITS meeting in Philadelphia on February 19, Committee E-6 on Papers and Publications will give consideration to the papers which have been offered for presentation at the 1937 annual meeting to be held at The Waldorf-Astoria in New York. A number of offers have been received and all members and others who wish to present papers should have their offers at A.S.T.M. Headquarters not later than February 15. Blanks to be used in transmitting the necessary information can be obtained from the Society office.

A summary must accompany each offer to make clear the paper's scope and point out features making it desirable for presentation.

Index to Standards Widely Used—Members Can Get Extra Copies

AS THE number of A.S.T.M. specifications and tests becomes larger, the Index to A.S.T.M. Standards and Tentative Standards assumes greater importance and utility. The Index is being used more and more widely and during the past year many requests have been received for copies. It is distributed without charge on request. In the near future the Index to Standards as of January 1, 1937, will be sent to each member. It gives under appropriate key words the titles of all Society standards and tentative standards together with exact page references to the current A.S.T.M. publications in which they may be found. Each standard is indexed under the principal subjects it covers.

If members desire additional copies for their associates or for other use they can be obtained without charge from A.S.T.M. Headquarters.

Errata Notice—Petroleum Oils Volume Correction Table

A TYPOGRAPHICAL error appears in the Standard Abridged Volume Correction Table for Petroleum Oils (D 206 - 36). In the table for Group 1, for an observed temperature, t , of 430 F. the multiplier, M , is 0.8631. It is incorrectly printed as 0.8731. This correction should be noted in the 1936 Book of A.S.T.M. Standards, Part II, page 992; also in the compilation of "A.S.T.M. Standards on Petroleum Products and Lubricants," page 334, September, 1936.

Errata Notice—1936 Book of Tentative Standards

ATTENTION of purchasers is called to the following errors made in printing pages 281 and 282 of the 1936 Book of A.S.T.M. Tentative Standards, in the Tentative Specifications for Magnesium-Base Alloy Ingot for Remelting (B 93 - 36 T):

Section 1 on Scope (page 281).—Change the first word in the third sentence from "eleven" to read "twelve," with a corresponding change in the numerals to provide for the recent addition to the specifications of a new alloy grade.

Section 3 on Chemical Composition (page 282).—In the table of chemical composition requirements change the minimum manganese requirement for Alloy No. 12 from "3" per cent to read "0.13" per cent. The word "remainder" under the second column of the table is incomplete. The accompanying corrected table may be pasted over the one in the 1936 Book of Tentative Standards.

Alloy	Magnesium, per cent	Aluminum, per cent	Manganese, min., per cent	Zinc, per cent	Copper, per cent	Cadmium, per cent	Tin, per cent	Silicon, max., per cent	Other Impurities, max., per cent
No. 1.....	remainder	8.0 to 9.0	0.18	.....	0.04 max.	.....	.....	0.2	0.3
No. 2.....	remainder	9.4 to 10.6	0.13	.....	0.04 max.	.....	.....	0.2	0.3
No. 3.....	remainder	11.5 to 12.5	0.13	.....	0.04 max.	.....	.....	0.2	0.3
No. 4.....	remainder	5.5 to 6.5	0.18	2.7 to 3.3	0.04 max.	.....	.....	0.2	0.3
No. 5.....	remainder	1.7 to 2.3	0.20	.....	3.3 to 4.7	1.7 to 2.3	.....	0.2	0.3
No. 6.....	remainder	3.5 to 4.5	0.25	.....	0.04 max.	.....	.....	0.2	0.3
No. 7.....	remainder	6.0 to 7.0	0.20	.....	0.04 max.	.....	.....	0.2	0.3
No. 8.....	remainder	6.0 to 7.0	0.20	0.4 to 1.0	0.04 max.	.....	.....	0.2	0.3
No. 9.....	remainder	8.0 to 9.0	0.18	0.2 to 0.8	0.04 max.	.....	.....	0.2	0.3
No. 10.....	remainder	.....	0.90	.....	0.04 max.	.....	5.3 to 6.7	0.1	0.2
No. 11.....	remainder	.....	1.30	.....	0.04 max.	.....	.....	0.1	0.2
No. 12.....	remainder	9.4 to 10.6	0.13	0.04 max.	1.0	0.3

* Nickel, max., 0.02 per cent.



BULLETIN

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Book on Modern Uses of Non-Ferrous Metals

IN HIS introduction to the book, "Modern Uses of Non-Ferrous Metals," published for the Seeley W. Mudd Fund by the American Institute of Mining and Metallurgical Engineers, Dr. C. H. Mathewson, editor of the volume, points out that the contributors of the 21 chapters, surveying the common metals and many minor metals that are metallurgically familiar as alloying elements but comparatively unknown to the general reader, have united in an effort to describe the useful development of metal products in their special fields in non-technical language and narrative style. The underlying motive has been to give the young engineer a picture of the metal industry as it exists today.

This volume is the seventh in the A.I.M.E. series sponsored by the committee for the Mudd Memorial Fund. The publications are designed as a memorial to Seeley W. Mudd whose outstanding work in engineering was characterized by a great interest in the welfare of his junior associates.

Following the opening chapter on the new industrial development and exploitation of metals and alloys by Zay Jeffries, prominent authorities develop the various subjects. There are chapters on aluminum by F. C. Frary, chromium by F. M. Becket, copper by C. H. Mathewson, lead by J. O. Betterton, nickel by P. D. Merica and zinc and cadmium by W. M. Peirce. Others deal with bismuth, cobalt, gold, magnesium, molybdenum, platinum metals, silver, tin, tungsten and several other non-ferrous metals, each by a technologist whose name is coupled with major developments in the respective fields.

Copies of this publication, 427 pages, in cloth binding can be obtained from A.I.M.E. Headquarters, 29 W. Thirty-ninth St., New York City, at \$3 net. A discount of 25 per cent is allowed on 10 to 20 copies and 33 1/3 per cent on 20 or more copies.

Another Problem

IN CONNECTION with the problem in the December BULLETIN concerning the laboratory worker who was assigned the task of making absorption tests on four bricks, several comments have been received from various members and discussion of the problem will be given in an early BULLETIN.

Another problem has been submitted as follows:

Mr. Smith one morning inadvertently left his purse at home and found himself without a cent of money. Fortunately, he had the day before received a check, which he cashed at the bank on his way to the office. Being in a hurry, he did not count the money he received from the teller. During the day he spent \$13.50, and on returning home in the evening he was astounded to find he still had in cash and bills twice the amount of the check. It subsequently developed that the paying teller had misread the check, reading cents on the check as dollars and dollars on the check as cents. What amount should he have paid Mr. Smith?

The answer to this problem will appear in the March BULLETIN.

Calendar of Society Meetings

(Arranged in Chronological Order)

- American Institute of Mining and Metallurgical Engineers
Annual Meeting, FEBRUARY 15-19
Engineering Societies Building, New York City
- Technical Association of the Pulp and Paper Industry
Annual Meeting, FEBRUARY 22-25
The Waldorf-Astoria, New York City
- American Concrete Institute
Fifty-third Annual Meeting, FEBRUARY 22-26
New York City
- American Railway Engineering Assn.
Annual Meeting, MARCH 16-18
The Palmer House, Chicago
- American Ceramic Society
Annual Meeting, Week of MARCH 21
The Waldorf-Astoria, New York City
- American Chemical Society
Semi-Annual Meeting, APRIL 12-15
Chapel Hill, N. C.
- Society of Automotive Engineers
Tractor Meeting, APRIL 21-23
Pete Marquette Hotel, Peoria, Ill.
- American Society of Civil Engineers
Spring Meeting, APRIL 21-24
San Antonio, Texas
- American Foundrymen's Assn.
Annual Convention and Exhibit, MAY 3-7
Milwaukee, Wis.
- American Society of Mechanical Engineers
Semi-Annual Meeting, Week of MAY 17
Detroit
- American Society of Refrigerating Engineers
MAY 25-27
French Lick Springs, Ind.
- American Water Works Assn.
Annual Convention, JUNE 7-11
Hotel Statler, Buffalo, N. Y.
- Engineering Institute of Canada
Semi-Centennial Celebration, Week of JUNE 15
Montreal and Ottawa, Canada
- Association of American Railroads, Mechanical Division
Annual Meeting, JUNE 16-23
Municipal Auditorium, Atlantic City
- American Institute of Electrical Engineers
Summer Convention, JUNE 21-25
Milwaukee, Wis.
- American Association for the Advancement of Science
JUNE 21-26
Denver, Colo.
- Society for the Promotion of Engineering Education
Annual Meeting, JUNE 28-JULY 2
Cambridge, Mass.
- American Society for Metals
National Metal Congress and Exposition, OCTOBER 18-22
Municipal Auditorium, Atlantic City

Catalogs and Folders Received

- EIMER & AMEND, INC., Third Ave., 18th to 19th Sts., New York City. Eighty-fifth Anniversary Catalog—Laboratory Apparatus and Supplies. Marks the completion of the eighty-fifth year of Eimer & Amend. Includes complete subject index. Also has A.S.T.M. index. 895 pages.
- ATLAS ELECTRIC DEVICES CO., 395 W. Superior St., Chicago, Ill. Folder covering the Weather-Ometer for weathering tests. 32 pages.
- THWING-ALBERT INSTRUMENT CO., 3339 Lancaster Ave., Philadelphia, Pa. Folder describing portable pH meters. Four pages.
- BAUSCH & LOMB OPTICAL CO., 636 St. Paul St., Rochester, N. Y. Folder describing new research metallographic equipment. Includes table of combinations of eyepieces and objectives recommended in A.S.T.M. standards. Six pages.



Society Accomplishments in 1936— and Future Work

(Continued from page 6)

The committee is considering newly developed and improved metallographic practices and a special subgroup on grain size classification of steels will give detailed study to the standard on this subject (E 19) and the coordination of several methods of grain size specification.

The cooperative investigation of X-ray diffraction as a means of detecting impending fatigue failure, carried on by the Research Committee on Fatigue of Metals and Subcommittee VI of Committee E-4 was continued and a report presented at the annual meeting. It was concluded that X-ray diffraction patterns do not register progress of fatigue fracture, but, rather, the progress of cold work.

The Research Committee expects to continue its cooperation with *Metals and Alloys* in the preparation of abstracts of articles on fatigue, to pay especial attention to size effects, effects of stress concentration and attempt to distinguish between stress concentration at notches and the properties of materials which render different metals sensitive in varying degrees to effect of a given notch.

Effect of Temperature

Five reports were sponsored by the Joint Research Committee on Effect of Temperature on the Properties of Metals during 1936 covering various activities of the committee, including a cooperative study of a stable 18:8 without stabilizing additions, seizure of metals, short-time tensile tests at 850 F. of the 0.40 per cent carbon steel, material K 20 (K 20 is the "standard" steel, stocked by the committee), long-time creep tests of 18 per cent chromium, 8 per cent nickel steel and 0.40 per cent carbon steel, and finally, high-temperature properties of cast and wrought carbon steels from large valves for high-temperature service. In its 1936 report to the sponsor societies the committee also presented a summary on low-temperature impact tests and a report on long-time creep tests of 18:8 and 0.35 per cent carbon steel.

The committee will continue to develop data on creep of metals and plans activities on other properties, both with respect to elevated and subzero temperature service.

Chemical Analysis of Metals

As indicated in the descriptive article in this BULLETIN, of the new volume on Methods of Chemical Analyses of Metals, Committee E-3 has completed the preparation of extensively revised and improved methods of analysis of steel, cast iron, open-hearth iron and wrought iron. These new tentative methods (E 30) supersede four existing standards.

Methods for determining nickel and tin in the analysis of brass ingots and sand castings have been developed and other changes are planned in this standard (B 45). Further procedures on several of the methods of analysis of ferro-alloys and non-ferrous metals are planned, with possible consolidation of certain of the methods.

Copper Wire; Non-Ferrous Metals

To meet the need for specifications covering a variety of copper alloy wires for electrical conductors and to make readily available equivalent high-strength conductors, there was issued a new tentative standard for hard-drawn copper alloy wires (B 105) prepared by Committee B-1. Two existing tentative specifications covering bare-stranded copper cable (B 8) and bronze trolley wire (B 9) were adopted as standard.

During 1936, Committee B-2 on Non-Ferrous Metals and Alloys effected a general reorganization and appointed eight subcommittees with specific assignments. These groups have numerous activities under way including studies of the metals tin and antimony. These investigations will include the properties of the metals, methods of analysis and sampling, and the characteristics desired by the consumers. In its work on coated metals, the committee has another section conducting studies of copper wire coated with a tin-lead alloy, a type of material used throughout the electrical industry.

Active steps are being taken to collect information prior to the preparation of a tentative specification for high nickel-copper alloys of the monel metal family. One proposed specification will cover sheet, including those of a grade suitable for pressure vessels and another specification contemplated is for bars and other shapes used in engineering structures.

Electrical-Resistance Alloys

A new tentative test method (B 106) was developed by Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys to cover the determination of the flexure-temperature characteristics of thermoflex (thermostatic metals) in the form of flat strips. Several changes were adopted in four other standards, previously developed by this committee. There was also issued a proposed draft published for information of methods for the bend testing of wire which covers three types of machines used to determine the stiffness of electrical-resistance wires. During the coming year specimens of wire are to be heat treated and distributed to committee members who have machines to enable comparisons of the test procedures.

Work is under way on the development of a life test method for heater elements for operation in electric furnaces, and a test for determining temperature resistance characteristics of sheet manganin.

Active work is in progress in the field of cast and wrought alloys for high-temperature use on standardizing the cast tensile specimens, conducting bend tests at elevated temperatures, oxidation and corrosion tests and completing the warpage tests. In the latter work a warpage test specimen in the form of an eccentric tube is being studied in connection with a method to determine the relative tendency of alloys to warp at high temperatures. To expedite the action, several alloy specimens were heated and quenched in water. Further tests are being made with oil as the coolant.

In the work on thermostatic metals activities will involve tests for bending stiffness, inelasticity, reversibility and working temperature range.

Because of the need for standardized test methods and specifications for metallic materials for radio tubes and incandescent lamps the scope of Committee B-4 has been



extended to cover this field. Technologists concerned with these fields are included in a new subcommittee being organized and a program of work is developing.

Copper Alloys

In addition to two new specifications approved as A.S.T.M. tentative standards in June, relating to materials not previously covered, namely, seamless copper-nickel alloy condenser tubes and ferrule stock (B 104) and sheet and strip phosphor bronze (B 103) three new specifications were issued, representing extensive revisions of existing standards, on the recommendation of Committee B-5 on Copper and Copper Alloys. These cover bronze castings for bridges and for locomotive wearing parts, and lined journal bearings (respectively B 22, B 66 and B 67). A number of changes were incorporated in other tentative and standard specifications and the tentative specifications covering copper-base alloys in ingot form for sand castings (B 7) were adopted as standard.

The committee is developing requirements for sheet and strip brass, including mixtures outside the range of composition of materials now specified and the studies of chemical and physical requirements of the casting alloys covered in existing standards, are being continued.

Die Castings

Committee B-6 on Die-Cast Metals and Alloys has continued its extensive series of indoor and outdoor atmospheric corrosion tests on twelve aluminum and ten zinc alloys exposed at ten locations. Tests made at two- and five-year periods have been reported—the next detailed test report is planned at the ten-year period. Additional exposure tests on zinc-base alloy No. XXIII and an alloy known as Zamak 5 are contemplated and two magnesium-base alloys will be included.

Aluminum-alloy die-cast specimens of higher purity than alloys Nos. IV and V have been tested after 12, 26 and 52 weeks' exposure to salt spray and after alternate immersion. The data indicate that the alloys of higher purity have superior resistance to attack—a detailed discussion of this work appears in the 1936 B-6 report.

An extensive paper by J. C. Fox, chairman of Subcommittee VI on Finishing Properties of Die Castings is also a part of the committee's annual report. It presents a review of the present methods used in finishing zinc and aluminum alloy die castings. The paper is of much interest because of the importance of finish of die castings from a sales and consumption standpoint.

Light Metals and Alloys

In the field of light metals and alloys, two new specifications were issued in 1936 covering magnesium-base alloy extruded bars, rods and shapes (B 107) and aluminum-base alloy permanent mold castings (B 108). In the former, four alloys are specified and in the latter there are eleven types of alloys. These were developed by Committee B-7 which also recommended a number of changes in six existing tentative specifications involving magnesium-base alloy products, in order that they would conform more closely to present commercial practice.

The committee is developing new specifications for aluminum alloy wrought shapes and its program also includes the gathering of information on the effect of variations in both major and minor constituents in the alloys included in the aluminum-base alloy sand castings and permanent mold castings. A subcommittee dealing with anodic oxidation of aluminum and aluminum alloys has obtained data by means of a questionnaire on requirements of the trade for anodized castings, methods of testing and the ability of the various coatings to withstand service conditions. Additional work is being planned on this subject.

Cement; Lime

Committee C-1 on Cement reported a large amount of data accumulated in the investigation of 34 high-early-strength cements, tested under nine different conditions as part of an extensive but only partially completed study of various accelerated tests for volume change. The principal indications of the progress report were summarized and the studies are being actively continued.

Considerable study and discussion was devoted to the subject of definition of portland cement and, while no change was made in the present definition of ordinary portland cement, as presented in the Standard Specifications for Portland Cement (C 9 - 30), there was important action with regard to the definition when revising the tentative specification for high-early-strength portland cement. The revision of this tentative standard and its advancement to standard (C 74 - 36) was an interesting development, since the new standard incorporates a number of decidedly new features. An optional compressive strength test is provided and the fineness tests are now to be made by the turbidimeter. A very important change was the deletion of the definition of portland cement and the provision that, subsequent to calcination, additions other than water or untreated calcium sulfate, or both, may be made, in amounts not to exceed 1 per cent, provided such materials have been shown not to be harmful by tests prescribed and carried out by Committee C-1. Such tests will be made, under certain conditions, by Committee C-1 through the Cement Reference Laboratory at the National Bureau of Standards or other laboratory which the committee may select. This is a decided innovation in the work of the Society and has just recently been approved. Nevertheless, such work has already been started in connection with one addition, the tests in this case being undertaken by the Cement Reference Laboratory.

Work is being continued on cooperative studies of methods of chemical analysis. There were reported two proposed methods for determining phosphorus and manganese in cement.

The Cement Reference Laboratory has continued its work of laboratory inspections, being now engaged in its fifth tour, in which tour there are already involved more laboratories than were visited in any one of the preceding tours.

The committee has before it for study a proposed new specification for natural cement. Study is also being made of possible improvements in the present masonry cement specifications. Specifications are being prepared for study by the committee to cover blended cements and slag cements.

In order to combine two former specifications for sand for use in plaster, a joint conference committee of members



of Committees C-7 on Lime and C-11 on Gypsum was appointed. The work of this group resulted in a new tentative specification (C 35) for sand for use in plaster, replacing two standards covering sand for use in lime plaster, and in gypsum plaster.

Committee C-7 is developing specification requirements for hydraulic lime and prepared fibered lime plaster, and is investigating test methods for determining the soundness of lime.

Brick

In 1936, Committee C-3 on Brick developed new tentative specifications (C 126) covering brick, tile and other masonry building units of clay or shale with a finish consisting of a vitreous glaze, excluding natural salt glazed ware. The committee will prepare standard methods of test for freezing-and-thawing tests on brick. At a recent meeting important changes in the specifications for building brick were outlined providing for the elimination of strength grading and giving a classification based upon weather resistance. Action on these may be recommended in 1937.

A study of the factors influencing the results of water absorption determinations has resulted in a decision to revise further the methods of testing brick and it is planned to supersede the existing standard C 67 - 31 with the tentative test method C 67 - 36 T after its adoption as standard.

Refractories

For several years Committee C-8 on Refractories has studied various methods of determining thermal conductivity of refractory materials at elevated temperatures. Cooperative tests were made in different laboratories and the results analyzed, but the discrepancies were so great that it appeared advisable to have a fundamental study made with the idea of developing suitable equipment which can be designated as standard. The National Bureau of Standards is undertaking this investigation and the committee is cooperating closely with the Bureau.

Considerable work has been done on the panel spalling test. Since the spalling test for fireclay brick (C 107) did not clearly separate high heat duty brick from super duty fireclay brick and because it was shown that a preheat temperature of 1650 C. instead of 1600 C. would bring out the difference, a new test method for super duty brick was developed and issued (C 122). Some work has been done toward refinement of the panel test method, such as mechanical regulation of the water pressure, a timing mechanism to control the flow of water, shifting of the panels, etc.

Nine tentative specifications and test methods for various refractories were adopted as standard, on the recommendation of Committee C-8 and several other constructive actions on standards were taken during 1936.

A number of projects will be continued by the committee. Specific methods of analysis for fireclay, silica, high alumina and other types of refractories are being prepared and a study of the determination of FeO content of chrome ore is being conducted.

New methods for testing fire brick for compression, flexure and absorption are being prepared. Modified Hirsch slag tests on several kinds of brick are being made and it is

planned to observe the effect of slagging on these brick in service.

Fire Tests

The formulation of suitable tests and standards of fire-resistance for doors as protectives on interior wall openings by Committee C-5 on Fire Tests of Materials and Construction, has suffered a set-back in the untimely death of Prof. A. H. Beyer of Columbia University, the chairman of the subcommittee dealing with this subject. The several discordant performance requirements, developed from viewpoints of whether the door is to serve purely as a fire barrier or whether its main purpose is the preservation of life against smoke and heat as well as flame, have presented difficulties that seem almost insuperable. With the reorganization of the subcommittee a new attack will be made on this project.

Proposed tentative specifications for testing, including requirements for acceptance of chemically treated wood for use in scaffolding and shoring to protect them from the ordinary fire hazards incident to construction operations have been developed by Committee C-5. A number of serious fires in recent years involving large values have made such specifications desirable.

In an effort to learn what, if any, definite relationship exists between the results of tests on small, easily handled specimens of materials or assemblies and results of tests on specimens of sizes sufficiently large to be more nearly representative of actual construction, a new subcommittee has been organized. The so-called full size test specimens involve considerable expense to the investigator or developer of new or modified forms of construction. It may be possible to ameliorate this factor to advantage in the promotion and extension of fire-resistive construction.

Concrete and Concrete Aggregates

Committee C-9 on Concrete and Concrete Aggregates completed three new tentative standards covering test for flow of concrete by use of the flow table (C 124) laboratory method of making flexure tests of concrete using a simple beam with third point loading (C 78), and method of test for coal and lignite in sand (C 123). Five existing tentative specifications were advanced to standard and other recommendations involving specifications and tests in the charge of the committee were approved.

By joint action of Committees C-9 and D-4 on Road and Paving Materials two new tentative test methods for specific gravity and absorption of coarse aggregate (C 127) and of fine aggregate (C 128) were developed. These methods are in effect revisions and consolidations of four other standards. A method for determining organic matter in fine aggregates and specification requirements for light-weight aggregates are expected to be completed during the coming year and Committee C-9 anticipates submitting for approval the test method for abrasion of aggregate using the Los Angeles rattler. This was printed as information in 1935 and has been revised somewhat.

Included in the new projects before the committee is a further study of methods for the determination of specific gravity of aggregates. It is desired to develop a highly accurate and strictly scientific basis which can be used as a



standard of comparison with more readily applicable routine laboratory and field methods.

Hollow Masonry Building Units

During the past year all of the tentative specifications and methods of testing under the jurisdiction of Committee C-10 on Hollow Masonry Building Units were advanced to standard. Tentative standards or standards for hollow building units, both of clay and of concrete, have been available for several years. These have undergone frequent revisions, largely for the clay units, because of the introduction of new designs of tile. In the preparation and revision of the standards, an attempt has been made to include only requirements which relate to the service value of the units, these being expressed by limitations on properties which are common to all designs rather than by confining the standards to units of particular shapes and sizes. The specifications now are believed to be in a form applicable to designs of units which may differ considerably from those common today.

There still is some dissatisfaction with the method of capping specimens for compressive tests. The method now specified seems to be satisfactory for most shapes but leads to low values for the apparent strengths of bonding tile. Arrangements have now been made to conduct an investigation on materials for and methods of capping structural clay tile. The investigation will be carried out in the laboratories of Rensselaer Polytechnic Institute under the direction of Prof. T. R. Lawson. It will be financed by a contribution from the Society through its Committee on Research, by manufacturers of tile who have offered to donate specimens for the tests, and by the laboratory which will donate its facilities and services. The investigation will include tests to determine the strengths of end construction and side construction tiles both of prismatic and of irregular shapes when capped by different methods using different capping materials. The results should afford data for determining which method of capping will yield strengths which are similar for tiles of similar materials but of different shapes.

The Committee is following with interest current investigations on the factors affecting durability of clay products and volume changes of concrete products.

Natural Building Stones and Slate

Committee C-18 on Natural Building Stones and Slate, which has eleven A.S.T.M. methods of test in its charge, recommended that four of the tentative methods be adopted as standard and this action was approved by the Society. These new standards cover absorption and specific gravity, flexure testing, modulus of elasticity and shear testing of natural building stone.

New subcommittees are being appointed on standardization of commercial samples and on slate. The former group will develop sampling procedures and a series of standard samples for commercial use with architects, engineers and builders, and other purposes.

A form of test procedure for determining values of abrasive hardness of stone and slate has been drafted for consideration and a number of projects involving definitions and terms, anchorage and anchorage practice are under way.

Paint, Varnish, Lacquer and Related Products

In both the fields of standardization and research, Committee D-1 on Paint, Varnish, Lacquer and Related Products made notable progress during the past year and it has an extensive program of work under way. In 1936, ten of this committee's tentative specifications and test methods were adopted as standard and changes were completed in several of the existing standards.

In an extensive report by the subcommittee on accelerated tests for protective coatings, appended to the 1936 report of Committee D-1, there is information and data on two series of accelerated weathering tests on varnishes. Several laboratories participated in the work using a number of different machines. In the second test exterior exposures were conducted at three locations, and photochemical embrittlement tests were also covered. Work in this field is continuing with other cooperative tests under way and additional activities are contemplated. The Symposium on Correlation of Laboratory and Service Tests to feature the A.S.T.M. 1937 annual meeting in New York, as outlined in this BULLETIN, will be of much interest to all concerned with various problems in this field.

Committee D-1 is making studies on zinc pigments, with particular reference to the question of distinction between French process and American process zinc oxide. Some of the latter product approaches the quality of the former very closely, and consideration is being given to the possibility of discontinuing the old distinction by process and the substitution of a classification based on chemical composition and physical properties.

The possibility of developing specifications for raw and burnt umbers and siennas is being studied. In pigments such as these, the shade, color and other physical properties are of major importance. Much attention has been given to the standardization of these details, particularly as to shade and color, by reference to vitreous tiles.

The proposed tentative specifications for titanium-magnesium pigment have been submitted to the committee for consideration, and revisions of the present A.S.T.M. specification for basic sulfate white lead are being developed.

Plans will be made shortly for the development of methods for the determination of dilution ratios of solvents and diluents, for evaporation rates of solvents, for blush resistance, and the establishment of standard specifications for a few plasticizers.

The committee plans to attempt the establishment of standard methods for the determination of hardness, abrasion resistance, distensibility, etc., of finished lacquers, and consideration is being given the development of a suitable color test for shellac.

Two new subcommittees have been appointed on specifications for interior flat paint and for spar varnish.

Petroleum Products

It will be seen from the article on another page of this BULLETIN concerning the recent meetings of Committee D-2 on Petroleum Products and Lubricants, that a number of important projects are being developed. During the past year there were a number of revisions of standards and tentative standards made on the recommendation of the com-



mittee, and the tentative test for gum content of gasoline (D 381) was adopted as standard.

Committee D-2 developed an abridged viscosity-temperature chart which has been printed on letter size sheets, covering a viscosity range from 37 to 200,000 Saybolt Universal seconds and a temperature range of -10 to $+300$ F.

Four proposed test methods were published in the committee's annual report for information and comment covering the following: kinematic viscosity by means of the suspended level viscosimeter and by the modified Ostwald viscosimeter; conversion of kinematic viscosity to Saybolt Universal viscosity; and neutralization number (potentiometric method). Also prepared and published were suggested uniform automotive engine lubrication recommendations and a revised classification of Diesel fuels.

Gaseous Fuels

The seven subcommittees of Committee D-3 on Gaseous Fuels which was organized in 1935 were active during 1936—detailed outlines of procedure were submitted prior to the March meetings and all such material was studied at that time and much preliminary work completed. A number of controversial points and definitions were disposed of subsequently by correspondence.

The subcommittee on measurement of gaseous samples has agreed tentatively that all measurements are to be expressed in English units and that the standard conditions under which gaseous samples are to be measured or to which such measurements are to be referred are temperature of 60 F; pressure of 30 inches mercury, the mercury to be at the ice point temperature; acceleration of gravity 32.174 feet per second per second; and complete saturation with water-vapor. The subcommittee also has defined a cubic foot of gas as that quantity which will fill a space of one cubic foot when at the above standard conditions.

Although the committee activities are confined to commercial gases combustible in air, it was anticipated even in the beginning that the development of satisfactory standards for sampling, measurement, determination of specific gravity, heating value, water vapor content, impurities, and complete analysis would require several years for completion. Different methods have been followed by various industries in making these determinations and there is considerable doubt concerning the accuracy of some of the existing procedures. The problems in hand involve many different types of gases, ranging in heating value from 150 B.t.u. per cubic foot to more than 3,300. It is possible that special methods may be required for certain gases although it is desired to avoid this expedient if possible. One pertinent instance of this kind involves the possibility of having to differentiate between manufactured and natural gas.

Coal and Coke

Committee D-5 on Coal and Coke has developed revisions of the modified procedure for determination of volatile matter of fuels which require a preliminary heat treatment to prevent the too rapid evolution of moisture and gases—the revisions giving more detailed instructions.

Manufactured products suitable for use as inert material in the agglutinating value test for coal are being investigated.

Silicon carbide appears to be the most promising of these products and tests are being conducted to determine if different lots will give identical results with the same coal.

Two methods of test for friability of coal have been developed, one of these being a drop shatter test similar in principle to the standard shatter test for coal, while the other method is a tumbler test by which the coal is tumbled in a cylindrical jar provided with lifting shelves. These two methods will be presented during 1937 for publication as tentative.

The subcommittee on mechanical sampling and reduction of samples has developed a procedure for the mechanical crushing and reduction of gross samples of coal. This method has been approved by Committee D-5. The subcommittee is continuing its investigation of methods of collection of gross samples of coal. The subcommittee on dustiness of coal and coke has prepared for study a procedure for determination of dustiness which will be tried out in various laboratories to determine its suitability.

The subcommittee on pulverizing characteristics of coal is revising the ball-mill method and the Hardgrove machine method which have been published as A.S.T.M. tentative standards. These revisions are the result of considerable experimental work conducted since the methods were published. In the case of the Hardgrove machine method the proposed revision greatly simplifies the size testing of the sample after grinding as it proposes to use only one sieve, the No. 200.

In order to investigate methods for determination of plasticity and swelling of coal in connection with the use of coal for coke making, a new subcommittee has been formed. A number of such methods have been published in this country and abroad, but they are necessarily very empirical in nature and require careful standardization to give comparable results when used in different laboratories.

The Sectional Committee on Coal Classification which is sponsored by A.S.T.M. under the procedure of the American Standards Association presented a new tentative method for designating the size of coal from its screen analysis (D 431). A revision was developed in the specifications for classification of coals by rank whereby the agglomeration test was substituted for the agglutinating value test in differentiating between certain groups of coal. The agglomeration test has the advantage of simplicity as it is based on the examination of the residue in the platinum crucible incident to the volatile matter determination.

The subcommittee on correlation of scientific classification with use classification completed its work in the preparation of charts giving the relative importance of factors that should be considered in the selection of coal for different uses. These charts will be published by the National Committee on Coal of the National Association of Purchasing Agents for information as a report of the subcommittee.

A footnote for inclusion in the tentative specifications for classification of coals by rank was prepared by the subcommittee on boundary lines for coal classification which footnote excepts from the classification certain coals of unusual physical and chemical properties which come within the limits of fixed carbon or B.t.u. of the high volatile bituminous and subbituminous ranks.



Road Materials

Included in the actions recommended by Committee D-4 on Road and Paving Materials, and approved during 1936, were the adoption as standard of tests for residue of specified penetration (D 243) and for separation of liquid asphaltic products (D 402). Several tentative standards were revised and because the committee plans extensive revisions in the specifications covering tars for surface treatment, a number were transferred from the status of standard to tentative. New methods of test for specific gravity and absorption of fine and coarse aggregates were issued as tentative, replacing existing standards.

Committee D-4 approved in substance and form the proposed simplified practice recommendation for coarse aggregates. If this is adopted a number of D-4 specifications will be affected.

The subcommittee on accelerated weathering tests is cooperating in the development of requirements for coatings on steel pipes. It is felt that in investigating this subject, tests should cover both physical and chemical changes brought about by the weathering of bituminous materials, and that the scope of work should be broadened to include changes due to methods of manipulating the material in actual construction work.

Timber and Timber Preservatives

Because zinc chloride is a widely accepted preservative for salt treatment of timber and since this treatment is becoming more widespread for lumber and in building construction, new specifications for zinc chloride were drafted and published as tentative in 1936 through the work of Committee D-7 on Timber.

In 1935 the committee developed revisions, in the form of a proposed new specification, of the standard specifications for joists, planks, beams and timbers (D 245). This was published for information. By action in 1936 this specification has been approved as tentative, superseding the former standard. It represents a method of rearrangement and the substitution of working stress values for grade names and provides structural grades designated in terms of design requirements and conforms to manufacturing conditions.

Activities for the coming year involve further study of the specifications for timber piles—involving analysis of incidental stresses, development of methods of sampling coal tar and creosote coal-tar solution, determining tar acids, and a definition for the term "coal tar" as used in wood preserving. Methods for the determination of moisture content of timber will be studied further, including the steam pipe oven procedure.

Waterproofing and Roofing Materials

Because extensive revisions are contemplated in a number of specifications in the jurisdiction of Committee D-8 on Bituminous Waterproofing and Roofing Materials these were reverted to the status of tentative. Studies being made include the specifications covering high-carbon and high bitu-

men coal-tar pitch for waterproofing and roofing and an attempt is being made to prepare one specification for each use to cover both high-carbon and high-bitumen pitches. Work on revised methods for testing felted and woven fabrics is progressing and samples are being tested in a cooperative program to evaluate present methods.

In its 1936 report the committee has included for information and comment two proposed test methods for sieve analysis of granular and non-granular mineral surfacing for asphalt roofing and shingles. Results of cooperative comparative tests with three different types of abrasion machines, designed to determine the effectiveness of embedding of granular mineral surfacing in the asphalt coating of the weather surface of asphalt prepared roofing and shingles are also given in the report.

Electrical Insulating Materials

A test method suitable for determining the saponification number of used and unused electrical insulating oils, as well as other oils used in the electrical industry, was issued as a new tentative standard (D 438) during the past year, as a result of the work of Committee D-9 on Electrical Insulating Materials and revisions were made in numerous other test methods and specifications. The test for pasted mica (D 352) was adopted as standard. Further use and study of the methods of testing for power factor and dielectric constant (D 150) resulted in an improved statement of procedure which is more general and fundamental. A new method for obtaining the density and coefficient of expansion of solid filling and treating compounds when they are in liquid condition at high temperatures was added to the test methods (D 176) for these materials.

Through its ten subcommittees, Committee D-9 has been active along many lines. A flow test for shellac is still under consideration. At the last meeting, Dr. W. H. Gardner presented a paper on the preparation of shellac films for electrical test. This paper dealt with the preparation of films from molten shellac and from shellac dissolved in solvents. Dr. Gardner's work indicates that molten shellac films are not practicable to prepare, while those obtained through solution indicated that traces of the solvent influence the electrical properties.

Attempts are being made to arrive at a single test for the time of set for phenolic resins. In the field of molded insulating materials, subjects still under study include shrinkage, test for cure, conditioning and arc resistance. A very active subcommittee, recently established, is preparing specifications for laminated phenolic materials for radio application. It is expected that in the near future proposed specification requirements will be ready for committee action. A section has also been formed to study vulcanized fiber, with current work covering water absorption, hardness and impact tests.

A new program for life tests of insulating oils is under consideration. The work on power factor, dielectric constant and resistivity tests will become very active with the receipt of a power-factor cell for use in round-robin tests. It is also proposed to conduct a round-robin test on a proposed method for measuring power factor of treated paper.

The study of the dielectric strength test method is being continued.

The work on glass for insulating purposes was summarized by a report at the June meeting. This section is working on a compressive strength test and transverse breaking strength test. Work is also in progress in connection with the measurement of electrical properties at high frequencies.

Since the publication of the tentative methods of measuring power factor and dielectric constant, activity has turned to the development of methods for measuring resistivity. It is also proposed to study the various methods of making dielectric strength tests with a view to developing a single comprehensive method.

The work on insulating papers and fibers has been devoted primarily to development of the oil penetration test for paper, coordination of mechanical tests with the Technical Association of the Pulp and Paper Industry, and attempts to coordinate the dielectric strength tests prepared by A.S.T.M. for insulating tapes and the methods used by the Insulating Power Cable Engineers Assn.

The subject of conditioning received considerable impetus through a discussion held during the 1936 Annual Meeting in Atlantic City. At the present time, consideration is being given to the requirements of various insulating materials and the selection of suitable conditions in order to make possible the application of control with a minimum of equipment.

Rubber Products

The various subcommittees of Committee D-11 on Rubber Products are actively engaged in programs involving both research and standardization work. In 1936 several recommendations of the committee were approved including the adoption as standard of three test methods covering rubber belting (D 378), braided hose (D 379) and wrapped rubber hose (D 380), and important revisions in eight tentative standards, six acted on at the annual meeting, and two through Committee E-10 procedure.

Much progress was made in the development of ways and means by which standard abrasion specimens having certified properties for use as a reference base in test methods could be made available. Some eleven laboratories are cooperating to determine whether satisfactory uniformity and duplicability of standards can be maintained. The committee reports that results have been encouraging. A similar study will pertain to tensile strength specimens.

Because of the importance of the air bomb aging test in determining effect of air at elevated pressures and temperatures on compounds, this being used in various forms by 18 of 22 laboratories surveyed, a standardized procedure is being prepared.

New methods of chemical analysis for determining sulfur, copper and manganese, the latter by the ammonium persulfate method, are being studied. Also under way is work involving reclaimed rubber and latex.

Other problems being investigated by Committee D-11 concern tests for physical changes of rubber and rubber-like products after immersion in solvents, testing adhesion under shearing stresses and coordination of physical test methods issued by various organizations.

Shipping Containers

The membership of Committee D-10 on Shipping Containers has been resolved into a Committee of the Whole to set up a definite program of developing and standardizing nomenclature and tests on materials and accessories used in the construction of containers. It has been found that there is some duplication and misunderstanding in the terms or names applied to this field, and it would be desirable that as far as possible such terms and names be definitely described and that such descriptions be adopted and used.

Of greater importance is the necessity of setting up standard methods and procedures for testing materials and accessories used in containers, and for testing the complete containers as a unit. Recent years have witnessed the introduction of new materials or old materials fabricated or processed by new methods, and the tendency is to determine their serviceability as containers or parts of containers on a performance test of the completed containers rather than on the part or the material itself. Proper comparisons can only be made when such tests are conducted under identical conditions and according to the same procedure.

It is probable that some of the testing methods now standard with the A.S.T.M. can be adopted in whole or in part, in following this program. It is planned to hold sectional meetings of the committee during the early part of the year and to discuss and adopt a detailed program in line with this general program.

Textile Materials

Activity and interest in the Society's work in the textile field carried out by Committee D-13 on Textile Materials has continued to grow. The committee had a most active year completing a number of important parts of its work, making excellent progress on others and starting active work on new projects. At two meetings in Washington and New York, each extending over three days, interesting technical programs were held with numerous papers on problems of interest to the committee. Articles on these sessions have appeared in previous Bulletins, and abstracts of the papers at the Washington and earlier meetings are given in the compilation of A.S.T.M. Standards on Textile Materials sponsored by the committee.

Four new tentative standards were published covering yarn slippage (D 434), fastness of dyed cotton (D 435), and of rayon and silk fabrics to laundering (D 436), and methods of testing and tolerances for certain carded cotton gray goods (D 433). Seven tentative test methods and specifications were adopted as standard covering the following: method for estimating hard scoured wool in wool in the grease; methods of testing and tolerances for tubular sleeving and braids, for woolen yarns and for worsted yarns; specifications for textile testing machines, asbestos yarns, and asbestos roving for electrical purposes.

Proposed methods of testing wool felt have been developed and are published as information in the 1936 compilation of A.S.T.M. Standards on Textile Materials. This book has been completely revised and rearranged by group-



ing related standards and an index of test methods has been added.

Three new subcommittees have been formed on woolen and worsted fabrics other than pile floor covering; bast fibers and their products; and household and garment fabrics. The latter two held organization meetings in October and inaugurated active programs of work.

Some conception of the widespread programs under way in the 25 D-13 subcommittees will be given by the following list of projects:

An evenness test for cotton yarns, regain in cotton yarn, study of methods of determining sizing, consolidation of tire fabric standards, finish of rayons for various purposes, test methods for spun rayon, shrinkage of rayon fabrics in home laundering; also—specifications for wool top, measurement of length of wool top, fineness of raw wool and wool in finished fabrics, specifications and test methods for yarns spun from mixtures of wool and other fabrics, wear test and fading for pile floor covering, and test methods and specifications for woolen and worsted fabrics.

Other activities involve electrical resistivity of asbestos textiles, definitions and methods of test for bast fibers, definitions and system of classification for household fabrics, methods of analysis of cotton and wool mixtures, and microscopical methods for quantitative analysis of mixtures of fibers. In addition to these the programs involve specifications for diaphragm bursting testers and testing machines other than strength testers, calibration methods for strength testers, rate of loading specimen-rate-of-load type testing machines, tolerance for temperature in defining the standard atmosphere, regain data on the various textile fibers, methods of conditioning specimens before test, fastness of dyed woolen fabrics to laundering, fastness of colored textiles to light, water resistance of textiles, and specifications and test methods for textile chemicals.

Naval Stores

During the coming year Committee D-17 on Naval Stores will concentrate its attention on the determination of the customary constants of rosin and methods for the determination of ash. Some additional work is also contemplated on crystallization of rosin in view of recent developments. The committee will also begin work on the study of the change of color in rosins on heating to the extent that is customary in the various industrial uses of rosin, in order to secure definite data on the extent and nature of color change that takes place in these various reactions.

There is little useful information on the subject of the size-making value of rosin. Efforts will be made to secure from paper makers, the chief users of rosin, data that will enable the committee to decide whether or not any constructive or useful results can be obtained by more active work on this subject.

Water

Continued progress has been made by Committee D-19 on Water for Industrial Uses and during the year proposed methods of analysis were issued in a special pamphlet for

the sulfate, hydroxide, carbonate and orthophosphate ions. Active work is under way on the development of analytical methods for the chloride, calcium and magnesium ions. Other items involve measurement of pH value and determination of dissolved oxygen.

The committee, in cooperation with the Joint Research Committee on Boiler Feedwater Studies, sponsored a session at the annual meeting at which several valuable papers were presented.

Two major activities of the Joint Committee, which is sponsored by six national societies, have continued with much success during 1936—namely, the work on effect of solution composition in the cracking of boiler metal, and the examination of methods of water analysis. Two papers on the first problem were given at the annual meeting, one on the application of solubility data to the treatment of boiler water to inhibit caustic embrittlement, the other giving details of the study which led to the recognition of silica as a factor in embrittlement.

Two important results emanated from the work on analysis—first, the development of a well-known reaction capable of electrometric measurement for the determination of oxygen, and second, the recommendation of a method to measure oxygen in water in which there are ions or elements that interfere with the reactions normal to the Winkler procedure.

Methods of Testing

Through its various technical committees and sections Committee E-1 on Methods of Testing made notable progress in its numerous activities during 1936. Four existing tentative standards were adopted as standard on the recommendation of the committee, involving methods for verification of testing machines, Rockwell hardness testing, terms relating to methods of testing and requirements for round-hole screens.

After studies of some two years in duration a new tentative method of test for softening point by ring-and-ball apparatus was issued. The new test procedure is an extension and modification of the existing standard and in addition to testing bituminous materials it is also applicable to rosins and most resins both natural and synthetic. Details of the test apparatus and procedure have been improved.

Recommended practices for the designation of numerical requirements in standards have been completed and are published as information. These recommendations are intended to be of assistance to the standing committees of the Society in the use of uniform terms and conventions in expressing the numerical requirements in specifications and methods of testing, and to facilitate the correct interpretation of such requirements. The proposals are designed to aid in clarifying the intended meaning of limiting values and permissible variations in specification requirements, with which test values are compared in the acceptance and rejection of materials.

An important report on investigative studies carried out at the University of Illinois is described in a paper by Paul G. Jones and F. E. Richart on "The Effect of Testing Speed on Strength and Elastic Properties of Concrete," appearing in Part II, 1936 *Proceedings*.

NEW MEMBERS TO JANUARY 22, 1937

The following 77 members were elected from December 10, 1936, to January 22, 1937:

Company Members (15)

ALLOY CAST STEEL CO., THE, W. A. Dorsey, Marion, Ohio.
AMERICAN LAVA CORP., Hans Thurnauer, Research Engineer, Chattanooga, Tenn.
BLISS, FAYAN AND CO., INC., S. W. Hays, Research Manager, 32 Thomas St., New York City.
CALCIUM CHLORIDE ASSN., Fred Burggraf, Materials Engineer, 4145 Penobscot Building, Detroit, Mich.
CONTAINER CORPORATION OF AMERICA, J. J. Brossard, Vice-President, 111 W. Washington St., Chicago, Ill.
FIBERLOID CORP., THE, E. A. Wilson, Director of Research, Worcester St., Indian Orchard, Mass.
FORT PAYNE BRICK AND TILE CO., J. H. Wood, Manager, Fort Payne, Ala.
GAYLORD, INC., ROBERT, H. L. Bode, In Charge of Laboratory, 2820 S. Eleventh St., St. Louis, Mo.
HOLLISTON MILLS, INC., C. L. Kingsford, Chemist, Lenox St., Norwood, Mass.
INTERNATIONAL EQUIPMENT CO., R. W. Hoyt, President and Treasurer, 352 Western Ave., Boston, Mass.
LOS ANGELES BRICK AND CLAY PRODUCTS CO., Gustaf Larson, Director in Charge of Manufacture, 1078 Mission Road, Los Angeles, Calif.
MONOLITH PORTLAND CEMENT CO., O. C. Hart, Chief Chemist, Monolith, Calif.
NATIONAL CARBON CO., INC., M. J. Dorcas, Manager of Lamp Dept., Box 6087, Cleveland, Ohio.
SHEARMAN CONCRETE PIPE CO., Tom Sherman, Treasurer, Southern Railway and Huron St., Knoxville, Tenn.
STEVENS PAPER MILLS, INC., THE, E. C. Armstrong, Technical Engineer, Westfield, Mass.

Individual and Other Members (57)

AITCHISON, A. G., Chemist, Warner Chemical Co., 405 Lexington Ave., New York City.
ATKINSON, F. W., Electrical Engineer, Owens-Illinois Glass Co., Newark, Ohio.
BATES, R. M., General Superintendent, Thomas M. Royal and Co., 5800 N. Seventh St., Philadelphia, Pa.
BERNARDIN, LEON, Civil Engineer, 437 St. Vincent St., Montreal, P. Q., Canada.
BITNER, W. H., Technical Adviser, Taunton-New Bedford Division, Revere Copper and Brass Incorporated, 24 N. Front St., New Bedford, Mass.
BROWN, C. L., Director of Development Dept., Standard Oil Co. of Louisiana, Box 551, Baton Rouge, La.
BURGER, A. A., George B. Gascoigne and Associates, Consulting Sanitary Engineers, Leader Building, Cleveland, Ohio.
BURKS, G. E., In Charge of Research Engineering, Caterpillar Tractor Co., 800 Davis St., San Leandro, Calif.
CAMPBELL, F. S., General Superintendent, Aruba Refinery, Lago Oil and Transport Co., Ltd., San Nicholas, Aruba, D. W. I.
CARMODY, E. J., Chief Metallurgist, The National Supply Co. of Delaware, Superior Engine Division, Springfield, Ohio.
CHRISTOPHER, C. F., Chief Metallurgist and Open Hearth Superintendent, American Locomotive Co., Railway Steel-Spring Division, Latrobe, Pa.
COWEN, ROBERT, Plant Manager, Flood & Conklin Co., 132 Chestnut St., Newark, N. J.
CURTIS, A. R., Junior Chemist, Massachusetts Department of Public Works, 100 Nashua St., Boston, Mass.
DANIELS, F. C. T., Vice-President, Mackintosh-Hemphill Co., 901 Bingham St., Pittsburgh, Pa.
EGBERT, FORD, Junior Civil Engineer, Soil Conservation Service, Waco, Tex. For mail: 703 S. Third St., Temple, Tex.
EVANS, H. A., Manager, Sulphide Corp., Ltd., Boolaroo, N. S. W., Australia.
FARNUM, J. M., Chemist, Taylor and Co., Inc., Norristown, Pa.
FRASER, W. R., Chief Chemist, Detroit City Gas Co., 415 Clifford St., Detroit, Mich.
GEORGE WASHINGTON UNIVERSITY, THE, F. A. Hitchcock, Executive Officer, Department of Civil Engineering, Washington, D. C.
GOULD, W. S., JR., Vice-President and Treasurer, Magnetic Analysis Corp., 42-44 Twelfth St., Long Island City, N. Y.
HAMILTON, DONALD, Assistant Engineer, Resettlement Administration, 2216 M St., N. W., Washington, D. C. For mail: Burnside Cottage, McLean, Va.
HANKINSON, R. L., Chief of Structural and Architectural Division, Bureau of Lighthouses, Department of Commerce, Washington, D. C.

HARRIS, H. F., Mercer County Engineer, Department of Engineering, Court House, Trenton, N. J.
HUNT, C. W., President and General Manager, Hunt Process Co., 7012 Stanford Ave., Los Angeles, Calif.
JACOBS, N. B., President, Morris Knowles, Inc., 507 Westinghouse Building, Pittsburgh, Pa.
KARCH, H. S., Chemical Engineer, Lima Cord Sole and Heel Co., 819 N. Jackson St., Lima, Ohio.
KATZ, ISRAEL, General Manager, J. Eavenson and Sons, Delaware and Penn Sts., Camden, N. J.
KILCAWLEY, E. J., Assistant Professor of Civil Engineering, Rensselaer Polytechnic Inst., Troy, N. Y.
LINCOLN, R. B., Engineer of Tests, Pittsburgh Testing Laboratory, Stevenson and Locust Sts., Pittsburgh, Pa.
LYNCH, T. J., Manager, Pittsburgh Testing Laboratory, Ellicott Square Building, Buffalo, N. Y.
MACAULEY, J. B., JR., Research Engineer, Chrysler Corp., 12800 Oakland Ave., Detroit, Mich.
MARDULIER, F. J., Field Engineer, Cement Division, Dewey & Almy Chemical Co., Cambridge B, Mass.
MATSUNAWA, BINTARO, Kikaku-han, Technical Committee, South Manchuria Railway Co., Dairen, Manchuria, China.
MCIVER, D. R., Vice-President, Original Bradford Soap Works, Inc., West Warwick, R. I.
MIAMI BEACH, CITY OF, M. N. Lipp, City Engineer, Miami Beach, Fla.
MORGAN, S. H., Chief Chemist, Shell Petroleum Corp., Arkansas City, Kans.
NEWKIRK, F. F., Chief Chemist, American Reinforced Paper Co., 55 Starkey Ave., Attleboro, Mass.
RAPP, PAUL, Associate Chemist, U. S. Bureau of Public Roads, Washington, D. C.
RICKETTS, D. D., Van Trump Testing Laboratory, 219 Terminal Warehouse Building, Little Rock, Ark.
ROWE, H. J., Metallurgical Engineer, Aluminum Co. of America, 2210 Harvard Ave., Cleveland, Ohio.
RUTGERS, L. L., Chief Chemist, The Emerson Electric Manufacturing Co., 1824 Washington Ave., St. Louis, Mo.
SCHULZ, E. H., Director, Forschungsinstituts Dortmund der Kohle-und Eisenforschung G.m.b.H., Aachenerstrasse 22, Dortmund, Germany.
SIMSON, A. L., Ceramic Engineer, Owens-Illinois Glass Co., Newark, Ohio.
SKINNER, H. J., President, Skinner & Sherman, Inc., 246 Stuart St., Boston, Mass.
STACEY, A. E., JR., Vice-President and Chief Engineer, Buensod-Stacey Air Conditioning, Inc., 60 E. Forty-second St., New York City.
SWINDEN, THOMAS, Director of Research, The United Steel Cos., Ltd., Central Research Dept., Stocksbridge, near Sheffield, England.
TODD, G. H., Texas Testing Laboratories, Inc., 1327 Wood St., Dallas, Tex.
UNIVERSITY OF GEORGIA, AGRICULTURAL ENGINEERING DEPT., R. H. Driftmier, Professor and Head of Agricultural Engineering Dept., Athens, Ga.
URDANETA, MAURICIO, Chemical Engineer, Testing Laboratory, Mexico Department of Roads, Tacuba 5, Mexico, D. F., Mexico.
WEBER, MATTHEW, JR., Chemical Engineering Superintendent, The Mathieson Alkali Works, Inc., Saltville, Va.
WESLEY, W. A., Research Chemist, The International Nickel Co., Inc., Research Laboratory, Bayonne, N. J.
WHITE, LAZARUS, President, Spencer, White & Prentiss, Inc., 10 E. Fortieth St., New York City.
WHYMAN, A. E., Construction Engineer, Universal Oil Products Co., Chicago, Ill. For mail: c/o Dr. V. Henny, Bush House, Aldwych, London, W. C. 2, England.
WOODS, K. B., Assistant Engineer, State Highway Testing Laboratory, Engineering Experiment Station, Ohio State University, Columbus, Ohio.
WORK, H. K., Manager of Research and Development, Jones & Laughlin Steel Corp., Pittsburgh, Pa.
ZAHN, H. S., Vice-President, Charles F. Kellom and Co., Inc., Ashburner St. and P. R. R., Holmesburg, Philadelphia, Pa.
ZEIGLER, C. C., Swift and Co., Union Stock Yards, Chicago, Ill.

Junior Members (5)

CONAWAY, H. L., Carnegie-Illinois Steel Corp., Laughlin Works, Martins Ferry, Ohio. For mail: 606 Delaware St.
FUSS, C. W., Laboratory Assistant, Pennsylvania Department of Highways, 1118 State St., Harrisburg, Pa. For mail: 241 North St.
HENDERSON, J. M., Latrobe Electric Steel Co., Latrobe, Pa. For mail: 338 Cherry St., Latrobe, Pa.
ROOP, F. S. JR., Instructor in Mechanical Engineering, Virginia Polytechnic Inst., Box 256, Blacksburg, Va.
WOOD, W. I., Chemical Construction Corp., 30 Rockefeller Plaza, New York City. For mail: 369 Carpenter Ave., Sea Cliff, N. Y.



NECROLOGY

We announce with regret the death of the following members and representatives:

AUGUSTUS H. GILL, Professor Emeritus, Massachusetts Institute of Technology, Cambridge, Mass. Member since 1905. Professor Gill was a member of Committee D-1 on Paint, Varnish, Lacquer, and Related Products.

JOHN H. GREGORY, Professor of Civil and Sanitary Engineering, The Johns Hopkins University, Baltimore, Md. Member since 1906.

C. W. MOWRY, Manager, Inspection Dept., Associated Factory Mutual Fire Insurance Cos., Boston, Mass. Mr. Mowry represented his company on Committee D-11 on Rubber Products and on Sectional Committee B-36 on Standardization of Dimensions and Materials of Wrought-Iron and Wrought-Steel Pipe and Tubing.

P. J. NEELY, Chief Metallurgist, American Locomotive Co., Railway Steel-Spring Division, Latrobe, Pa. Member since 1936. Mr. Neely was a member of Committee A-1 on Steel and several of its subcommittees and Committee A-2 on Wrought Iron.

GEORGE W. SARGENT, State College, Pa. Member since 1910. Mr. Sargent was a former member of Committees A-1 on Steel and A-9 on Ferro-Alloys.

FRANCIS R. WADLEIGH, Consulting Engineer, Alexandria, Va. Member since 1908. Mr. Wadleigh, a former member of Committee D-5 on Coal and Coke, was an authority on coal. He was a former head of the coal division of the Department of Commerce and, in 1923, Federal fuel distributor.

DANA PORTER WELD, Supervisor, Research and Development Division, General Laboratories, Socony-Vacuum Oil Co., Inc., Paulsboro, N. J. Member since 1934.

William Campbell 1876-1936

WILLIAM CAMPBELL, Howe Professor of Metallurgy, Columbia University, died suddenly on December 16, 1936, of a heart attack. He was preparing a lecture when he passed away. A native of England his education was received at Kings College, London, and Durham University, and in this country at Columbia, where he won the degrees of Doctor of Science and of Philosophy. In 1929 Columbia awarded him the honorary degree of Doctor of Science.

Since 1904 he had been a member of the faculty at Columbia and Howe Professor of Metallurgy since 1914. He was also Metallographer with the U. S. Geological Survey 1908 to 1912, and with the Bureau of Mines 1912 to 1918.

He had been a member of the Society since 1903 and while he contributed to many phases of Society work and was a member of many committees, his outstanding contribution concerned his service as chairman of Committee B-2 on Non-Ferrous Metals and Alloys. In 1934, after 25 years as head of this committee, he was honored by election to the office of honorary chairman, having presented his resignation as chairman because of ill health. One of the members of the committee in writing of Doctor Campbell's work, pointed out that "At the time (1909) this committee was appointed the field which it was to occupy was practically virgin. But little reliable information was to be found in the literature. Such knowledge as existed was largely confined to the technical staffs of manufacturers and was closely guarded.

"Under the inspiration and leadership of Doctor Campbell such information as was necessary for the proper functioning of the committee was made available. In addition, members of the committee were stimulated to institute and conduct research where necessary to fill up existing gaps. As a consequence the committee has to its credit many accomplishments which merit and receive the confidence of all interests."

Doctor Campbell served as a member of the A.S.T.M. Executive Committee from 1924 to 1926 and for many years was a member of Committees A-4 on Heat Treatment of Iron and Steel, A-5 on Corrosion of Iron and Steel and E-4 on Metallography. He was a member of many American and British scientific and technical societies.

He presented a large number of technical reports and papers before the Society and other organizations. Perhaps his outstanding editorial contribution to A.S.T.M. was the preparation of the "List

PERSONALS

News items concerning the activities of our members will be welcomed for inclusion in this column.

L. W. BASS, formerly Director of Research, The Borden Co., is now Assistant Director, Mellon Institute of Industrial Research, Pittsburgh, Pa.

L. E. EKHOLM is now connected with the Alan Wood Steel Co., Conshohocken, Pa., as Metallurgical Engineer. He was formerly with Henry Disston & Sons, Inc., Philadelphia.

THOMAS A. MCGEE is now Vice-President, Forty Eight Insulations, Inc., Aurora, Ill. He was formerly Secretary and Treasurer, Drake, McGee & Hallsted, Inc., New York City.

O. W. ELLIS, Director of Metallurgical Research, Ontario Research Foundation, Toronto, Canada, has been elected a trustee of the American Society for Metals.

C. F. KETTERING, General Director, Research Section, General Motors Corp., has been elected to the board of directors of the National Cash Register Co. Before entering the automotive industry he was, for seven years, inventor and engineer with that company. Mr. Kettering has also been elected a director of the National Geographic Society.

FRED SANDBERG, JR., formerly Chemist, Republic Oil Refining Co., is now Assistant Superintendent, Old Dutch Refining Co., Muskegon, Mich.

MAX SCHUSTER is now Director, Bureau of Standards, L. Bamberger & Co., Newark, N. J. He was connected with the Better Fabrics Testing Bureau, New York City, as Technologist.

J. M. WATSON, formerly Metallurgist, Hupp Motor Car Co., Highland Park, Mich., is now connected with the Jones & Laughlin Steel Co., Detroit, Mich.

L. C. CONRADI, formerly Metallurgist, International Business Machines Corp., Endicott, N. Y., has been appointed Technical Research Director with the same company.

A. N. TALBOT, Professor Emeritus, University of Illinois, Urbana, Ill., has been awarded the 1937 John Fritz Gold Medal, highest of American engineering honors. Professor Talbot, who is a past-president and an Honorary Member of A.S.T.M., was cited as "molder of men, eminent consultant on engineering projects, leader of research and outstanding educator in civil engineering." This award is made annually by a board composed of 16 past presidents of the four Founder Societies.

J. H. HERRON, President, The James H. Herron Co., Cleveland, Ohio, was elected President of the American Society of Mechanical Engineers at its recent annual meeting.

T. R. AGG, Dean of Engineering, College of Engineering, Iowa State College, Ames, Iowa, was given the George H. Bartlett award for achievement in highway work at the recent meeting of the Highway Research Board. The basis for the award was Dean Agg's research work in highway engineering and economics for the Iowa Engineering Experiment Station. The Bartlett award is given by the American Association of State Highway Officials, the American Road Builders Assn., and the Highway Research Board.

W. H. FULWEILER, Consulting Chemist, Wallingford, Pa., was recently elected President of the Rittenhouse Astronomical Society.

Addresses Wanted

Anyone knowing the present address of either of the following members, whose last-known addresses are given below, is asked to notify the Secretary-Treasurer:

FRANK JONATES, Chemist, W. H. Barber Co., 3650 S. Homan Ave., Chicago, Ill.

STANLEY NEWMAN, Treasurer, Stanley Newman Co., Little Building, Boston, Mass.

of Alloys" which was first published in 1922 and later revised and reissued in 1930.

In his death the Society loses a faithful, long-time member, one who rendered meritorious service to the Society and who constantly had its welfare at heart. Though his many friends and associates in Society work will sorely miss his presence, his efforts on behalf of the Society and in the general advancement of technical knowledge in his chosen field of metallurgy will be a long-time source of inspiration.

